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## 53RD ANNUAL MEETING

# *Florida Scientist*



## *Program Issue*

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BOTANICAL GARDEN

Volume 52

Supplement 1

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## 1989 PROGRAM ISSUE

THE FIFTY-THIRD ANNUAL MEETING OF THE  
FLORIDA ACADEMY OF SCIENCES

in conjunction with the

American Association of Physics Teachers  
(Florida Section)

and the

Florida Junior Academy of Sciences  
and  
Science Talent Search

Featuring Three Symposia

"Impact of Sea Level Rise on the Coast of Florida"

"Management of Non-Game Wildlife: Beyond Planning  
to Implementation"

and

"Natural History of North Florida's Barrier Islands"

With Two Plenary Addresses

"Achieving Cholesterol Control" by Dr. Gene Ness

"Science and Ethics - An Explosive Mix?"  
by Sidney M. Goetz, Esq.

FLORIDA COMMUNITY COLLAGE AT JACKSONVILLE  
MARCH 30, 31, APRIL 1, 1989

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## NOTICES

HANDICAP ACCESS - All meeting rooms are accessible to those in wheelchairs. Meeting participants having special needs should contact Dr. Paula Thompson, Florida Community College at Jacksonville (904-646-2312) prior to March 22.

SMOKING - Smoking is prohibited in all interior spaces.

ACKNOWLEDGMENTS - Production of the 1989 Program Issue was made possible through the support of Saint Leo College and HDR Engineering, Inc.

## MEETING INFORMATION

LOCATION - Florida Community College at Jacksonville was founded by the Florida legislature in 1963 and opened with a charter class of 2610 students in 1966. It has since grown to four campuses with more than 72,000 students enrolled in college credit or continuing education courses each year.

REGISTRATION - ALL PARTICIPANTS ARE EXPECTED TO REGISTER. A registration desk will be open in Building U, room U152 from 7:30 AM to 4:00 PM on Friday, March 31, and from 8:00 AM to 9:30 AM on Saturday, April 1.

The registration fee is \$15.00 for members, \$20.00 for nonmembers, and \$5.00 for students. Members receive the Florida Scientist by mail, as will others registered by March 6. A late registration fee of \$5.00 will be assessed for members and nonmembers (students excepted) registering after March 6. Extra programs cost \$3.50.

LODGING - No reservations can be made through the Academy. The following facilities have agreed to the special conference rates shown if you identify yourself with the Florida Academy of Sciences. All require a credit card number or one night prepayment for reservations.

The following hotels are located in Jacksonville Beach approximately eight miles from the campus:

Golden Sands Motel: 127 First Avenue South. (904)249-4374.  
Single \$28 / Double \$37 / Triple \$40 / Quad \$48.

Holiday Inn Oceanfront: 1617 North First Street. (904)249-9071.  
(800)331-2817 (FL only). Single or Double \$49 / Triple \$54 /  
Quad \$59.

Howard Johnson on the Ocean: 1515 North First Street. (904)249-3711. \$40 for 1-4 persons

Ramada Resort: 1201 North First Street. (904)241-5333.  
\$46 for 1-4 persons.

Sheraton Jacksonville Beach: 1031 First Street. (904)249-7231.  
(800)621-6738 (FL only). \$46 for 1-4 persons.

The following hotels are located at I-95 and J. Turner Butler Boulevard area in Jacksonville approximately eight miles from campus:

Economy Inns of America: 4300 Salisbury Road. (904)281-0198.  
Single \$29.20 / Double \$33.90 / Triple \$37.90 / Quad \$41.90.

Hampton Inn South: 4690 Salisbury Road. (904)281-0443.  
\$39 for 1-4 persons.

Jacksonville Marriott Hotel: 4670 Salisbury Road. (904)739-5800.  
\$55 for 1-4 persons.

**BANQUET AND MEALS** - The Academy Social and Banquet will be held on Friday evening (March 31). The Social will be held from 6:30 until 7:30 at the Sheraton Jacksonville Beach. Dinner will be held at 7:30 and will consist of one of the following entrees: 1) roast sirloin of beef au jus, 2) baked cod with seasoned bread crumbs and lemon/butter sauce, or 3) vegetarian platter. Each of the above will be served with tossed salad, bread and butter, mashed potatoes, green beans almandine, chocolate mousse, and coffee, tea or decaf. Only a few tickets will be available on the day of registration so preregistration for the banquet is suggested.

The campus cafeteria will be open for lunch on Friday. Information on local restaurants will be available at registration.

**Transportation** - The Lem Turner Travel Agency has made it's services available to the Academy for this meeting. They will book flights on Piedmont Airlines for Annual Meeting participants at 35% off coach rate and 5% off lowest available fare. For further information, contact Linda Ward at the travel agency (800-262-5767 or 904-768-3225).

Greater Jacksonville Transportation will provide cab service from the airport to/from the Jacksonville Beach hotels (\$30.00 for 1-4 persons) or the I-95 and J. Turner Butler area (\$23 for 1-4 persons). Contact Mary Regan (904-356-8808) with flight information and identify yourself as an Annual Meeting participant.

Florida Community College at Jacksonville will have a van available for transportation from the beach area and J. Turner Butler area to campus depending on need. If you are interested in such service please contact Marsha Dasaro, FCCJ, at (904)632-3150).

**FIELD TRIPS** - Dr. Merril Varn of the Jacksonville Museum of Science and Industry (904-396-7062) is coordinating several field trips to be held during this years meeting. The trips are free and are described below. Low cost lunches and transportation will be arranged if there is sufficient demand.

1. University of North Florida Nature Trail - The entire university area, located two miles from FCCJ's South Campus, is a nature preserve. Several marked trails, accessible to the disabled, can be walked at a leisurely pace in the guided tour for young and old. This field trip will be held Friday Morning, March 31.
2. Jacksonville Museum of Science and History - The newly renamed and renovated museum just opened this past fall. It houses three floors of hands-on activities and exhibits for all ages. Its' science theater and planetarium are internationally recognized. Trip participants will have a special "laboratory" making brass rubbings. This field trip will be held Friday afternoon, March 31.
3. Jacksonville Art Museum - Friday morning will be spent at this home of the finest regional collection of Oriental porcelains and other well known paintings and sculptures. We will proceed to the Cummer Gallery of Art and then lunch at Riverside. After lunch, we will tour historic Riverside with its wonderful old homes. This field trip will be held all day Friday, March 31.

4. The Jacksonville Crime Lab - Participants will have a chance to see some real-life Quincy's at work. Lots of Chemistry and Biology. This field trip will be held Saturday afternoon, April 1.
5. Little Talbot Island - North Florida's best kept secret, Little Talbot Island is home to flora, fauna and Indian mounds. FCCJ's Dr. Felicia West will lead an oceanside trip exploring this very special state park. This field trip will be held all day Saturday, April 1.

**LOCAL ARRANGEMENTS** - Academy meeting arrangements at Florida Community College at Jacksonville are coordinated by Dr. Paula J. Thompson, Professor of Natural Science, who may be consulted on special meeting needs by calling (904)646-2312.

Slide and overhead projectors will be available in each meeting room. Individuals requiring other types of projection equipment or computers for their presentations should contact Professor Claire Dewberry at (904)646-2073.

Faculty and staff at FCCJ shold be contacted, if necessary, prior to March 22 due to College holidays.

#### ANNOUNCEMENTS

**FAS MEETING SYMPOSIA** - Three symposia will be held as part of this year's meeting:

1. "Impact of Sea Level Rise on the Coast of Florida," Saturday, April 1, 8:00AM-11:30AM, Building N, room 229. This symposium was organized and will be chaired by Gary Zarillo, Florida Institute of Technology.
2. "Management of Non-Game Wildlife: Beyond Planning to Implementation," Friday, March 31, 10:00AM-12:15PM, Building G, room 104. This symposium was organized and will be chaired by I. Jack Stout, University of Central Florida.
3. "Natural History of North Florida's Barrier Islands," Friday, March 31, 8:00AM-9:15AM, Building G, room 104. This symposium was organized and will be chaired by Paula Thompson, Florida Community College at Jacksonville

**PLENARY SESSIONS** - Our Plenary Session I speaker this year is Sidney M. Goetz, Esq. His topic will be "Science and Ethics - An Explosive Mix?"

The annual FAS business meeting will follow Mr. Goetz' lecture.

Our Plenary Session II speaker is Dr. Gene Ness of the University of South Florida. Dr. Ness is the 1988 FAS Medalist, and his lecture topic will be "Achieving Cholesterol Control." The lecture will follow the FAS Annual Banquet beginning at 7:30 P.M., Friday, March 31.

**STAND INS AND CANCELLATIONS** - If an author or a co-author of a scheduled paper cannot present the paper due to unforeseen circumstances, he should arrange for a colleague to read the paper. If a reader cannot be found, the paper should be cancelled. The Academy should be notified of a substitute reader or of an intent to cancel. In such a case, contact either George Dooris (904-588-8338), Patricia Dooris (813-287-1960), or the appropriate Section Chairman.

## PROGRAM SUMMARY

THURSDAY AFTERNOON, MARCH 30, 1989

1:30 PM FAS Council Meeting.....U 152

FRIDAY MORNING, MARCH 31, 1989

7:30 AM Registration (to 4:00 PM).....	U 152
8:00 AM Agricultural Sciences A*.....	N 228
Biological Sciences A.....	G 103
Biological Sciences F - Symposium.....	G 104
8:30 AM Science Teaching A*.....	N 230
9:00 AM Anthropology A*.....	N 235
Atmospheric & Oceanographic A*.....	N 229
Computer & Math A*.....	N 233
10:00 AM Biological Sciences B*.....	G 103
F.C.R.E.P.A. A* - Symposium.....	G 104

FRIDAY AFTERNOON, MARCH 31, 1989

1:30 PM Plenary Session I.....	G 101
3:00 PM Agricultural Sciences D.....	N 228
Biological Sciences C.....	G 103
Biological Sciences D.....	G 104
Environmental Chemistry A*.....	N 230
Medical Sciences A*.....	N 229
Physics & Space Science A.....	N 233

FRIDAY EVENING, MARCH 31, 1989

6:30 PM Academy Social.....	Sheraton
7:30 PM Banquet and Plenary Session II.....	Sheraton

SATURDAY MORNING, APRIL 1, 1989

8:00 AM Registration (to 9:30 AM)	
Atmospheric & Oceanographic B - Symposium.....	N 229
8:30 AM Biological Sciences E.....	G 103
Engineering Science A*.....	N 233
9:30 AM AAPT A*.....	N 233
Geology & Hydrology A*.....	N 235
Social Sciences A*.....	N 228

SATURDAY AFTERNOON, APRIL 1, 1989

1:30 PM AAPT B.....	N 233
Geology & Hydrology B.....	N 235

\* Business meeting follows this session

PUBLICATION - Authors of papers presented at this year's Annual Meeting should consider submitting their manuscripts to the Florida Scientist, the Academy's journal, for publication consideration. Further information may be obtained from Dean F. Martin, Editor, Florida Scientist, CHEMS Center, Department of Chemistry, University of South Florida, 33620 (813-974-2374).

AGRICULTURAL SCIENCE

FRIDAY 8:00 AM N-228

SESSION A

L. G. ARVANTIS, University of Florida, presiding

8:00AM AGR-1 Yield Components and Seed Yield of Pigeonpea Under Differential Irrigation. R. Kablan and G. M. Prine, University of Florida, Gainesville 32611. Pigeonpea (Cajanus cajan L. Millsp.) is a perennial leguminous crop which shows potential as grain crop in Florida. The study was conducted on Arredondo fine sand at the main Agronomy farm at Gainesville in summer of 1987. Two lines of pigeonpea were subjected to variable timing of supplemental water application to determine an optimum irrigation schedule and its effects on yield parameters and final seed yield. Partitioning of dry matter and growth stage most affected are examined. The responses of the two pigeonpea lines are compared. Irrigation during vegetative growth only and all growing season increased leaf area index (LAI) and leaf, stem and total shoot biomass over that scheduled during the reproductive growth only and control (rainfed). Seed yield was not significantly affected by treatments. Line FL 76w exhibited higher LAI and stem and leaf dry weight compared to FL 99w, however the seed yield of FL 76w was lower than FL 99w.

8:15AM AGR-2 Growth and Partitioning of Dry Matter in Three Corn Cultivars in Florida. D. L. OVERMAN AND R. N. GALLAHER, Univ. of Fl., Inst. of Food and Agr. Sci., Dept. of Agronomy, Gainesville 32611. The objectives of this research were to determine (1) corn (Zea mays L.) dry matter (DM) and grain yield differences among a temperate hybrid ('Pioneer Brand 3320'), a tropical hybrid ('Pioneer Brand X304C'), and an open-pollinated experimental cultivar (Fl. open pollinated upright ear experimental of the 8th selection ('FLOPUP')), and (2) growth rates among the various vegetative, reproductive and total corn tissues affected by cultivar. The experiment was conducted at two locations at Green Acres Agronomy Farm near Gainesville, Fl. in 1988. Twelve harvest samplings were made beginning at 35 days after planting (DAP) and ending at 150 DAP. Total plant DM reached a maximum about 112 DAP. Maximum whole plant DM was 23.8, 20.1 and 21.9 Mg/ha for 3320, X304C and FLOPUP, respectively. The maximum ear DM in 3320 was at 112 DAP; in X304C at 119 DAP; in FLOPUP at 126 DAP. Grain yield was over 14,000 kg ha<sup>-1</sup> for 3320; 10,500 kg ha<sup>-1</sup> for 304C; and 7,800 kg ha<sup>-1</sup> for FLOPUP.

8:30AM AGR-3 Yield Components in Corn Affected by Cultivar and Population. GONZALEZ, N. G. AND R. N. GALLAHER. Dept of Agronomy, Inst. Food Agr. Sci., Univ. of Florida, Gainesville 32611. The experiment was conducted at Green Acres, Agronomy farm in a Arredondo soil with two corn (Zea mays L.) hybrids; 'Pioneer Brand 3020', and 'Pioneer Brand X304C' and one open-pollinated cultivar ('Flopup') Florida Tropical F8 at four different plant densities; 25,000, 50,000, 75,000 and 100,000 plants (pl)/ha. Samples were taken at soft dough and at black layer formation of the seed. Stem, leaf, grain, cob, and shuck dry matter (DM) and leaf area data were collected. The two hybrids showed a linear increase in DM accumulation to the highest population. Flopup showed an increase only to 75,000 pl/ha which was due to a loss of plants at the 100,000 pl/ha treatment. Leaf area index also increased linearly for all cultivars to the highest plant population except for Flopup. The two hybrids were similar in leaf area at 100,000 pl/ha. The Stem DM/Leaf DM ratio decreased as population increased but a different pattern was found for the two hybrids vs. the open pollinated cultivar.

8:45AM AGR-4 On-Farm Crop Nutrition Investigation of Perennial Peanut Under Low Management Inputs. R. W. RICE, R. N. GALLAHER, E. C. FRENCH, AND J. KISAKYE, Agronomy Dept., IFAS, Univ. of Fl., Gainesville 32611. The 'Florigraze' cultivar of perennial peanut (Arachis glabrata Benth.) holds promise as a drought and pest resistant, high quality forage crop suitable to well-drained sandy soils of Florida. Florigraze was established on a Grossarenic Paleudult in February 1986. In September 1988, the stand displayed randomly distributed patches of deficiency symptoms. Leaves on unhealthy plants were chlorotic, especially at the tip and along the outer edges, with necrosis in the more severely affected plants. Leaf, stem and rhizome dry matter accumulation was sharply reduced in deficient plants. Relative to published recommended leaf nutrient concentrations for Arachis hypogaea, N and P were mildly deficient in both healthy and deficient plant leaves while K was present in very low concentrations. Soil extractable K was 13 and 9.5 mg/kg in areas with healthy and deficient looking plants, respectively. The most limiting nutrient appeared to be K, based on phenotypic symptoms, tissue and soil analyses.

9:00AM AGR-5 Nutrient Compostion of Stock-Piled Bermudagrass as Affected by Fertilizer Nitrogen Rate and Method of Application. J. F. HOLDERBAUM, R. N. GALLAHER, AND O. C. RUELKE, Agronomy Dept., University of Florida, Gainesville 32603. Application of fertilizer N (FN) has been shown to improve both quality and quantity of bermudagrass (Cynodon dactylon L. Pers.) under multiple clipping harvest regimes. However, there is a need for information on the nutritive status of bermudagrass under stock-piled management conditions. A study was conducted to determine the effects of FN rates and application methods on 'Tifton 78' bermudagrass that was allowed to accumulate growth from 22 June 1988 to 9 September 1988. The leaf to stem ratio tended to be higher following split applications of FN. Data on bermudagrass yield parameters, leaf and stem nutrient composition, and soil fertility status will be presented.

9:15AM AGR-6 Crop Nutrition Investigation of an On-Farm Problem with Peanut in Columbia County, Florida in 1988. G. R. STOCKS, R. N. GALLAHER, and E. B. WHITTY, Graduate Student and Professors of Agronomy, respectively, Agronomy Department, Institute of Food and Agriculture Science, University of Florida, Gainesville 32611. Peanut (Arachis hypogaea L.) is an important agronomic crop to North Florida farmers. The peanut is generally grown on sandy soil types which need proper fertility management for maximum peanut yields. In certain elliptical-shaped spots in the field evaluated, peanut plants displayed extreme stunting and chlorosis. Over a distance of approximately 1 m, plants progressed from severely stunted to normal. Plant tissue and soil samples were collected from both the stunted and normal areas and were analyzed for mineral concentration. When the results of the mineral analysis were compared to critical values for deficiencies and toxicities of nutrients in peanut plant tissue, it was revealed that the Zn concentration in stunted plant tissue was well above toxic levels. Consequently, it was determined that the problem with the stunted peanuts was Zn toxicity.

9:30AM AGR-7 Effects of Two Crop Rotations on Peanut Leaf Nutrient Concentrations and Soil Populations of Meloidogyne arenaria. T. A. LANG (1), R. N. GALLAHER (1), AND D. W. DICKSON (2), (1) Agronomy Dept. and (2) Nematology Dept., IFAS, Univ. of Florida, Gainesville 32611. Root-knot nematode (Meloidogyne arenaria) can reduce quality and yield of peanut (Arachis hypogaea). Leaf and soil nutrient concentrations and soil populations of second-stage juvenile (J2) M. arenaria were determined for 'Southern Runner' peanut planted on an Arredondo fine sand (Grossarenic Paleudult) in Levy County, Florida under two crop rotations

(Bahiagrass (Paspalum notatum)/peanut (BG/P) vs peanut/vetch (Vicia villosa)/peanut (P/V/P)). Peanut plants from the P/V/P rotation exhibited general chlorosis and stunting which coincided with deficient levels of K in the leaves. Populations of J2 M. arenaria in the P/V/P soil were double those in the BG/P soil. Extractable soil nutrients were slightly higher in the BG/P soil. The BG/P soil was also higher in organic matter content. A BG/P cropping system should reduce M. arenaria populations and improve soil fertility and peanut yields.

9:45AM AGR-8 Forage Sorghum Growth and Nutrition Affected by Soil Variability. D. P. LILLY AND R. N. GALLAHER, Agronomy Dept., Inst. of Food and Agr. Sci., Univ. of Fl., Gainesville 32611. A field experiment with forage sorghum (Sorghum bicolor L. Moench) cultivar DeKalb 'FS 25-A' was conducted on a sandy soil where a clay-gall was present. Soil and plant samples were taken 41 days after planting to determine and illustrate the effect of soil texture variability and residual soil fertility on the growth and mineral nutrition of forage sorghum. Five treatments were designated as 25, 50, 75, 100, and 125 cm plant heights. Soil samples were analyzed for pH, organic matter (OM), N, P, K, Ca, Mg, Fe, Mn, Cu, Zn, and Al. Plant samples were analyzed for dry matter and N, P, K, Ca, Mg, Fe, Mn, Cu, and Zn concentrations. Soil samples increased in extractable nutrients and OM from the 25 cm to the 125 cm plant height treatments. Plant samples increased in N and K concentration but decreased in Ca and most micronutrients as plant height increased from 25 to 125 cm. These data show the strong influence of soil variability on growth and nutrient relationships in forage sorghum.

10:00AM BREAK

10:15AM AGR-9 Leaf and Stem Nutrient Status Affected by Age and Ornamental Species. S. H. ANGELL (1), R. N. GALLAHER (1), AND T. H. YEAGER (2), (1) Dept. of Agronomy, (2) Dept. of Ornamental Horticulture, Inst. Food and Agr. Sci., Univ. of Florida, Gainesville 32611. Relationships between soil and plant nutrient concentrations are useful in determining the health of plants. The objective of this study was to examine concentrations of perennial woody ornamental leaf and stem tissues as affected by age. Pittosporum tobira (Thunb.), Rhododendron Mrs. G. G. Gerbing L., Podocarpus macrophyllus (Thunb.), Ilicium parviflorum Michx., and Buxus microphylla (Siebold & Zucc.) were grown at the University of Florida on manipulated Typic Hyperthermic Quartzisamments. With the exceptions of Ca and P, the nutrient concentrations in the plant tissues were below normal levels as reported in the literature. Plant nutrient levels increased and decreased with age as predicted by the literature. With few exceptions, plant nutrient ratios also appeared low. These plants received sporadic fertilization and it is possible that more attention should be given to the nutritional status of woody ornamentals on the University of Florida campus.

10:30AM AGR-10 Plant Nutrient Relationships Affected by Differential Sicklepod Infestation of Soybean. R. N. GALLAHER, S. U. KEMBOLO, AND D. L. COLVIN. Agronomy Dept., IFAS, Univ. of Fl., Gainesville 32611. Sicklepod (Cassia obtusifolia L.) weed competition is one of the primary limiting factors in soybean (Glycine max (L.) Merr.) production. This study investigated the competitive effects of sicklepod on 'Cobb' soybean planted on a Grossarenic Paleudult in 1988. Dry matter (DM) yield and nutrient content of soybean was inversely related to DM yield and nutrient content of sicklepod. Ratios of vegetative to pod soybean DM accumulation showed that sicklepod competed more for reproductive soybean yield loss than vegetative. At the population density of 5 sicklepod/m<sup>2</sup>, nutrient contents in sicklepod were higher than in soybean. The reduction of nutrient contents in soybean pods at 5 sicklepod/m<sup>2</sup> was 85, 84, 85, 85, 81, 86, 81, 84, and 83% for N, P, K, Ca, Mg, Cu, Fe, Mn and Zn, respectively. The reduction of nutrient contents in soybean vegetative tissue at 5 sicklepod/m<sup>2</sup> was 74, 75, 64, 76, 67, 80, 71, 72 and 68% for N, P, K, Ca, Mg, Cu, Fe, Mn and Zn, respectively.

10:45AM AGR-11 Production of Two Small Grain Cultivars on Phosphatic Clays. C. S. GARDNER, G. M. PRINE, R. D. BARNETT AND E. C. FRENCH. Agronomy Dept., 304 Newell Hall, University of Florida Gainesville 32611. Florida 201 triticale and 301 wheat were studied for their yield potential in Polk county Florida over the growing seasons of 1986-87 (S1) and 1987-88 (S2). Studies conducted included response to N application and date of planting. Five equally spaced N levels of 0, 56, 112, 168 and 224 kg ha<sup>-1</sup> and two planting dates, early, Nov-Dec (EP) and late, Jan (LP) were imposed. High soil fertility masked the response to N in S1 but the 112 kg ha<sup>-1</sup> N rate gave best grain yield response of over 3,000 kg ha<sup>-1</sup> for both cultivars in S2. In both seasons grain filling was slower for the EP compared to LP. Yield of triticale and wheat EP were 37 and 27% less respectively than LP in S1 but was approximately 50% higher in S2.

11:00AM AGR-12 Perennial Peanut-Corn Association on Phosphatic Clay Settling Pond Soil. E. C. FRENCH, E. A. HANLON AND G. J. HOCHMUTH, Agronomy Dept., Soil Science Dept. and Vegetable Crops Dept., respectively, IFAS, Univ. of Florida, Gainesville 32611. Physical structure inherent to phosphatic clay settling pond soil provides little support for mechanized field operations during rainy/moist soil periods. A study has been initiated using perennial peanut (*Araachis glabrata* Benth.) sod (pcs. 40 by 20 cm) planted continuous in rows 90 cm on center. Perennial peanut forms an integrally woven matrix of underground rhizomes up to 8 cm in thickness. The study was set-up (now one year into peanut establishment) to evaluate the effectiveness of the rhizome matrix to support tractor weight under moist soil conditions and to evaluate the yield of sweet corn interplanted between the planted sod rows under varying levels of applied N and K<sub>2</sub>O. Results from similiar studies conducted on Arredondo fine sand have resulted in significant yield reductions of corn grain and stover from field corn planted with minimum tillage methods. There was a significant corn-grain yield response to N fertilizer applied up to 140 kg ha<sup>-1</sup>.

11:15AM AGR-13 Corn Yield Response to Tillage, Hybrids, and Insecticides. J. R. ESPAILLAT, AND R. N. GALLAHER. Agronomy Department, IFAS, Univ. of FL. Gainesville 32611. Researchers have reported differential and conflicting responses of corn (*Zea mays L.*) to insecticides. This research was conducted to determine if tillage and corn genotypes could be the reasons for these responses. Two sets of experiments were conducted. In one 3-yr study no-tillage and conventional tillage were main plots and four insecticide treatments were split plots (1.1 kg carbofuran (CF1)/ha, 2.2 kg (CF2)/ha, 2.2 kg terbufos (TF)/ha, and a control (C)). In three other studies six hybrids were main plots with the same insecticides as split plots. Grain yield, plant height, and population at harvest were measured. Treatments with CF2 gave higher grain yield in no-tillage, but TF gave equal grain response in conventional tillage. When 'Asgrow RX777' (developed using TF) was treated with TF, it averaged 32 q/ha more grain than the C. Also, 'Dekalb XL71' (developed using CF) yield 28 q/ha more grain with CF2 than with the C. These interactions suggested that a hybrid will respond better to the insecticide used during its breeding development.

11:30AM AGR-14 Effects of Cropping System, Tillage Management and Soil Type on Soil Contents of Humic and Fulvic Acids. J.F. CORELLA AND R.N. GALLAHER, Dept. of Agronomy, Inst. Food Agr. Sci., Univ. of Florida, Gainesville, 32611. Limited information exists about humic acid (HA) and fulvic acid (FA) interactions with cropping systems and tillage management. The purpose of this study was to determine the influence of cropping history and soil type on HA and FA as affected by long-term no-tillage (NT) and conventional tillage treatments (CT). Three soil types and six cropping systems from seven experiments in Florida and Argentina were included in this study. In

every treatment of all experiments HA and FA acids decreased progressively with increasing soil depth. No tillage was always higher in HA and FA near the soil surface compared to CT. Monocrop corn (Zea mays L.) at both Florida and Argentina locations and the Oat (Avena sativa L.) -sorghum (Sorghum bicolor L.) system showed a higher content of FA than HA. On the other hand oat-soybean (Glycine max (L.) Merr.), rye (Secale cereale L.)-summer crop, soybean monocrop and wheat (Triticum aestivum L.)-soybean systems had a higher content of FA than HA. Argentina soils had a higher content of HA and FA (2.65 and 2.15 times greater, respectively) than Florida soils.

## 11:45AM BUSINESS MEETING

FRIDAY 1:30 PM G-101  
PLENARY SESSION I: Florida Academy of Sciences  
MARVIN IVEY, Hammond and Holmam, P.A., presiding

FRIDAY 3:00 PM N-228  
SESSION B  
L. G. ARVANTIS, University of Florida, presiding

3:00PM AGR-15 Root-Knot Nematode Resistance in Red Clover Relatives (Trifolium spp.). C.N. KOUAME (1), D.D. BALTENSPERGER (1), K.H. QUESENBERRY (1), AND R.A. DUNN (2); (1) Agronomy Department, (2) Entomology and Nematology Department, IFAS, University of Florida, Gainesville, Fl. 32611. An extensive collection of red clover (Trifolium pratense) and four related species (T. diffusum, T. medium, T. pallidum, and T. sarosiene) were evaluated in the greenhouse for resistance to three of the most important root-knot nematodes (Meloidogyne spp.). Appreciable variation for response to root-knot nematodes was observed and, for the first time, nematode resistant lines have been identified in species related to red clover. The largest number of resistant lines were found in the distantly related T. medium, but lines with low gall scores were also identified in the closely related T. diffusum.

3:15PM AGR-16 Plant Disorder Diagnosis of Southern Runner Peanut Based on Soil and Plant Analysis. R. W. RICE (1), R. N. GALLAHER (1), AND D. W. DICKSON (2), (1) Agronomy Dept. and (2) Nematology Dept., IFAS, Univ. of Fl., Gainesville 32611. Root-knot nematode (Meloidogyne arenaria) infestation can reduce both quality and yield of peanut. Soil populations of second-stage juvenile (J2) M. arenaria and leaf/soil nutrient concentrations were determined for 'Southern Runner' peanut (Arachis hypogaea) planted on a Grossarenic Paleudult in Levy County, Fl. Localized patches of deficiency symptoms were present within an overall healthy-looking stand. J2 M. arenaria counts in soils supporting deficient plants were 44% higher than for soils with healthy plants. Severe symptoms appeared as pale yellow/white leaves with necrotic spots. Decreasing severity with older plant tissue coincided with deficient levels of Mn in leaves. High soil test Ca and concentrations in deficient tissues may explain the deficient levels of plant K. Visual K deficiency was not present, possibly masked by the phenotypic expression of Mn deficiency. Soil pH with deficient plants was 8.2, coinciding with reduced Mn uptake.

3:30PM AGR-17 Potential of Energy and Industrial Crops Grown on Phosphatic Clays. G. M. PRINE (1), W. G. BLUE (2) AND P. MISLEVY (3), University of Florida, (1) Agronomy Department and (2) Soils Department, Gainesville and (3) Ona Agricultural Research and Education Center, Ona. Over 100,000 acres of phosphatic settling pond clays exist in Polk and surrounding counties. The annual-regenerating perennials: Leucaena leucocephala, elephantgrass (Pennisetum purpureum), energycane (Saccharum spp.) and Erianthus arundinaceum have commonly made annual oven-dry biomass yields in excess of 40 Mg ha<sup>-1</sup> on the settling pond clay soils. Often these crops contained the energy equivalent of over 100 barrels (42 gallons) ha<sup>-1</sup> of oil. Much of the energy equivalent can be utilized by converting the biomass into methane, alcohol or direct burning of dry biomass. The annual crops, forage and sweet sorghums (Sorghum bicolor) and kenaf (Hibiscus cannabinus) have also made high biomass yields. Kenaf looks particularly promising as a feedstock for making quality paper.

3:45PM AGR-18 Safety and Tolerance of Two Formulations of Ivermectin in Suckling Foals. J. KIVIPELTO AND R. L. ASQUITH\*, University of Florida, Animal Science Department, Gainesville, FL 32611. Eighteen Quarter Horse (n = 13) or Thoroughbred (n = 5) suckling foals were utilized to determine whether 3 times the use level of ivermectin liquid or 5 times the use level of ivermectin paste, administered 3 times will elicit signs of toxicity. Seven female and 11 male foals aged 26 - 59 days were allocated to receive water (placebo) at 0.06 ml/kg, ivermectin liquid at 600 mcg/kg or ivermectin paste at 1000 mcg/kg orally 3 times at 14 day intervals. Foals were examined at 6, 12 and 24 hours and at least once daily for 7 days following treatment for evaluation. Foals before and after all treatments were determined to be clinically normal and showed no treatment related adverse effects.

4:00PM AGR-19 Genotype by Media Interaction for Tissue Culture of Alysicarpus vaginalis. P. A. KROTTJE, D. S. WOFFORD, D. D. BALTENSPERGER, AND K. H. QUESENBERRY. 2183 McCarty Hall, Agronomy Department, IFAS, University of Florida, Gainesville 32611. Four genotypes of Alysicarpus vaginalis L. DC. were evaluated for callus growth, color, and plant regeneration. Leaf disks were plated on L2 medium for 28 days to allow for callus development. Calli within genotypes were then randomly subcultured on 2 different basal salt media (L2 and MS) each with 4 different hormone levels (combinations of 0.1 and 0.5 mg L<sup>-1</sup> IAA and 4 and 8 mg L<sup>-1</sup> BAP) giving a total of 8 media treatments. Differences due to media and genotypes increased over time with genotype FLAC-10 producing the most prolific callus and FLAC-1 and FLAC-4 producing the least prolific callus. Media effects were most pronounced on FLAC-100 where media containing L2 basal salts resulted in significantly more callus growth than cultures grown on MS basal salts. The highest hormone levels (0.5 IAA + 8 BAP) gave the best overall calli produced within a basal medium treatment.

4:15PM AGR-20 A Computer Simulation Approach to Sampling Efficiency. L.G. ARVANITIS (1), AND R.M. REICH (2), (1) University of Florida, Gainesville 32611, (2) Colorado State University, Ft. Collins 80521. Sampling efficiency in forestry, range, ecology, and other plant sciences, is affected by the number of elementary sampling units, the method of sampling, the area and shape of each individual sample as well as the variability of the population under study. The sampler has a number of options available in deciding on the most appropriate design, which will maximize the precision of the estimate for a given cost or minimize the cost for a required level of precision. To evaluate the expected efficiency of alternative solutions to a given problem, the authors have developed a microcomputer program, called Forest Sampling Simulator or FOSS, which is divided into three main modules: Population, Plot Configuration, and Sampling Design.

4:30PM AGR-21 Quantification of Microsite Variability on Slash Pine Growth: A Case Study. R.M. REICH (1), AND L.G. ARVANITIS (2), (1) Colorado State University, Ft. Collins 80521, (2) University of Florida, Gainesville 32611. Site uniformity in designing forest experiments is seldom found in the field. Plots may appear similar in soil type, drainage, and topography but close examination usually reveals microsite differences, which affect at least the early growth of trees. The authors advocate a statistical procedure to estimate the microsite component in a randomized block design with fixed effects. The procedure is based on a generalized least squares approach to partitioning the model variance into two components: One due to microsite and the other one due to random errors. An iterative procedure is then used to solve for the maximum likelihood estimate of the microsite component. The approach has been tested in a spacing trial of Pinus elliottii, Engelm. in north Florida.

FRIDAY 6:30 PM SHERATON JACKSONVILLE BEACH  
SOCIAL

FRIDAY 7:30 PM SHERATON JACKSONVILLE BEACH  
BANQUET AND PLENARY SESSION II  
FLORIDA ACADEMY OF SCIENCES

#### ANTHROPOLOGICAL SCIENCE

FRIDAY 9:00 AM N-235  
SESSION A  
JANET CHERNELA, Florida International Univ., presiding

9:00AM ANS-1 Preliminary Report on the Subadult Dentition of Early Archaic Indians in Central Florida. JOHN T. BARTON, Department of Anthropology, Florida State University, Tallahassee 32306. The subadult dentition of 51 individuals is examined using mesiodistal, buccolingual, and cusp height measurements. This sample population is from the Windover site (between 7,000 and 8,000 B.P.) located near Titusville, Florida. Comparisons of left vs. right dentition as well as upper vs. lower dentition are made. This Hunter-Gatherer sample is statistically compared to other populations, including middle Archaic, Woodland, Mississippian, Historic, and modern European and aboriginal New World populations. Based on this study, the early Florida dentition appears larger than later populations. The author would like to gratefully acknowledge the guidance and assistance of Dr. Glen Doran of Florida State University.

9:15AM ANS-2 Season of Occupation Determination Utilizing Sclerochronology for Two Sites on Florida's West Coast. PAUL L. JONES University of Florida, Dept. of Anthropology, Gainesville 32601. Samples of southern quahogs, Mercenaria campechiensis were excavated from archaeological shell middens at two locations in the Cedar Keys National Wildlife Refuge. Quahog shells provide seasonal markers in their shell growth patterns which correspond to changes in their aquatic environment. These markers form distinct patterns of growth for different seasons of the year. When the markers from the archaeological specimens were compared against the modern sample of N=228 specimens from the same area, season of death could be determined. The archaeological specimens examined in this study indicated that at the North Key site (8Lv65) the harvest of Mercenaria took place at all seasons of the year, while the specimens from the Seahorse Key site (8Lv64) proved to be inconclusive.

9:30AM ANS-3 Assessment of Cortical Thickness by Computed Tomography in an Early Archaic skeletal sample from Windover (8Br246). A. M. ESTES, Department of Anthropology, Florida State University, Tallahassee 32306. The Windover archaeological site is an Archaic mortuary pond dated to about 7500 years BP. The Nordin and anterior-posterior (AP) indices were calculated utilizing computed tomography images of femoral cross-sections. These two indices made it possible to differentiate between age and diet-induced cortical involution among the Windover individuals. Results indicate that individuals in this population had levels of activity and nutrition which were adequate for maintaining normal bone mass throughout the life span. The study also highlights the role of the AP index as an indicator of age-induced cortical bone loss, and confirms that bone loss in later years is sex related. The results additionally point to the similarity of bone dynamics in prehistoric populations and modern groups.

9:45AM ANS-4 Settlement and Social Complexity in the Everglades: An Analysis of Subsistence Remains from the Honey Hill Site (8Bd411) In a Regional Perspective. MARILYN A. MASSON, Department of Anthropology, Florida State University, Tallahassee, Fl., 32306. Middens of South Florida contain data which represent the evolution of social complexity. Determining degrees of population density and sedentism in prehistoric times are important questions related to social process. The results of an analysis of subsistence remains from the Honey Hill site (8Bd411), located on the Atlantic Coastal Ridge at the eastern periphery of the Everglades are presented. This data is compared to midden analyses from other south Florida sites, and the degree of prehistoric sedentism is addressed. The proportions of seasonally available vs. year round species are compared and a procurement continuum from coastal to inland sites is outlined. The proposition that sites were more densely and permanently inhabited prior to historic times is tested.

10:00AM BUSINESS MEETING

FRIDAY 1:30 PM G-101  
PLENARY SESSION I: Florida Academy of Sciences  
MARVIN IVEY, Hammond and Holman, P.A., presiding

FRIDAY 6:30 PM SHERATON JACKSONVILLE BEACH  
SOCIAL

FRIDAY 7:30 PM SHERATON JACKSONVILLE BEACH  
BANQUET AND PLENARY SESSION II

ATMOSPHERIC AND OCEANOGRAPHIC SCIENCES

FRIDAY 9:00 AM N-229

SESSION A

GARY ZARILLO, Florida Institute of Technology, presiding

9:00AM AOS-1 Immunological Identification of Marine Species Using the Rock Shrimp (*Sicyonia brevirostris*) as a Model. H. AN, C.I. WEI, K.J. KAO, AND P.A. KLEIN Dept. Food Science and Human Nutrition and Dept. Pathology and Lab. Medicine, University of Florida, Gainesville, FL 32611 Using monoclonal antibodies (McAbs), immunochemical methods including ELISA, immunodot blot and Western blot have been developed to detect or quantitate specific proteins from the rock shrimp (*Sicyonia brevirostris*). Anti-rock shrimp McAbs were developed using rock shrimp-specific proteins isolated from bands in SDS-PAGE gels. These antibodies were specific for rock shrimp and reacted with both denatured and native shrimp proteins. This method can be used to identify marine species using native as well as denatured samples. Furthermore, the approach can be applied to develop McAbs for studying the biochemistry and physiology of important components of marine animals.

9:15AM AOS-2 Do Beds of the Alga Caulerpa prolifera Provide Animal Habitat Comparable to that of Seagrass? KEHL, M.J.\*., R.W. VIRNSTEIN, AND, W.G.NELSON\*, \*Florida Institute of Technology, Melbourne 32901. St. Johns River Water Mngmt. Dist. Palatka 23077. In some areas of Florida, beds of the alga Caulerpa prolifera are expanding and possibly replacing seagrass. Are such beds of attached Caulerpa ecological equivalents of seagrass beds? To assess the habitat value of Caulerpa for animals, comparative sampling was carried out in Caulerpa and beds of the seagrass Halodule wrightii. Quarterly sampling used fish traps, dip nets, a special grab sampler, and a posthole corer. Data show significant differences between plant types for the mean number of species and individuals for all fish trap samples. Significant differences were found in the mean number of individuals but not in the mean number of taxa during July dip net sampling. However, in February, no significant differences were found. No significant differences have been found in any epifaunal samples.

9:30AM AOS-3 Polycyclic Aromatic Hydrocarbons Associated with an Artificial Reef Constructed of Coal and Oil Ash Waste Products. ROBERT FREASE and JOHN G. WINDSOR, JR., Department of Oceanography and Ocean Engineering, Florida Institute of Technology, 150 West University Boulevard, Melbourne, 32901-6988. Polycyclic aromatic hydrocarbons have been found to be associated with flyash emitted from and retained by, oil-fired electric power plants. Typical disposal procedures for incineration wastes include dumping the ashes on the land, in mines or into the sea. Stabilized oil and coal ash wastes have been used to construct small-scale artificial reefs off Indian River County, Florida. Several conclusions have been drawn thus far from the PAH studies. Levels of PAH measured in the ash matrix are comparable to what one would observe for contaminated offshore sediment. The stabilization process appears to considerably reduce the "extractability" of PAH with hot organic solvents. Finally, the low molecular weight PAH species, those most water soluble, appear to be relatively abundant when compared to most sedimentary distributions of PAH.

9:45AM AOS-4 Stormy Weather: A New Theme for Water Quality Monitoring in the Indian River Lagoon. NORMAN D. FARMER and JOHN G. WINDSOR, JR., Department of Oceanography and Ocean Engineering, Florida Institute of Technology, Melbourne, 32901-6988. Variations in water clarity in Indian River lagoon are related to freshwater runoff. A one year investigation of water quality in Turkey Creek began in 1987. Water samples were collected for temperature, salinity, TSM, turbidity, D.O., and PO<sub>4</sub><sup>3-</sup>, weekly and more intensively during storm events. The pattern of spring droughts followed by routine summer thunderstorms is common along the lagoon. Water clarity remains high, until the first major storms of the year when soils, nutrients and oxygen-consuming organic matter are transported to the lagoon. The results of this study suggest that current monitoring strategies do not adequately describe the impact of storm events on lagoon water quality. Transport of these materials from the drainage basins, through the tributaries, and on to the lagoon during storm events has seriously impacted the health of the lagoon and must be understood and controlled to restore the lagoon.

10:00AM BREAK

10:15AM AOS-5 Marine Field Projects: An Established, Unique, Undergraduate Curriculum in Oceanography and Ocean Engineering. JOHN G. WINDSOR, JR., Marine Field Projects Program, Department of Oceanography and Ocean Engineering, Florida Institute of Technology, 150 West University Boulevard, Melbourne, 32901-6988. The Department of Oceanography and Ocean Engineering at Florida Institute of Technology offers a unique program of undergraduate, oceanographic studies, the highlight of which is Marine Fields Project. Students participate in an intensive program of field studies which attempts to get the student to apply his classroom and land based laboratory acquired knowledge to real world situations. Of great significance to this program is a series of research projects conducted along the Indian River lagoon in biological, chemical, physical and geological oceanography and ocean engineering. The implication of this program as an accessory tool to state and local government programs in lagoon monitoring and enhancement will be discussed.

10:30AM AOS-6 The Effects of Urbanization Upon the North Central Segment of the Indian River Lagoon. BILLIE WEBB and JOHN G. WINDSOR, JR., Marine Field Projects Program, Department of Oceanography and Ocean Engineering, Florida Institute of Technology, 150 West University Boulevard, Melbourne, 32901-6988. As part of an annual summer research program, undergraduate students of the Oceanography and Ocean Engineering Department have collected and analyzed water and sediments in the north central segment of the Indian River lagoon basin. Coarse grained sediment dominates the lagoon, but where fine grained sediments appear, high organic loadings are noted. The fine grained, organic rich sediments coincide with the input of fresh water from Turkey Creek, Crane Creek and Eau Gallie River. Water clarity, which has been of great concern along the lagoon regarding the long term viability of seagrass beds, was notably high during the summer of 1988, which may be related to the lack of rainfall during the study period.

10:45AM AOS-7 Daily, weekly, seasonal and annual variations in salinity, temperature and dissolved oxygen at the interface between Crane Creek and the Indian River Lagoon. GLENN BYER and JOHN G. WINDSOR, JR., Marine Field Projects Program, Department of Oceanography and Ocean Engineering, Florida Institute of Technology, 150 West University Boulevard, Melbourne, 32901-6988. As part of an annual summer research program, undergraduate students of the Oceanography and Ocean Engineering Department have collected and analyzed water and sediments in the north central segment of the Indian River lagoon basin. Salinity, temperature and dissolved oxygen were recorded at 1 foot depths along Crane Creek, on a daily, and weekly basis during the summer of 1988. The salinity, temperature and dissolved oxygen structures will be described. Of particular interest is the variability encountered in the observations. The implication to water quality monitoring programs will be developed.

11:00AM BUSINESS MEETING

SATURDAY 8:00 AM N-229

SESSION B: Symposium

"Impact of Sea-Level Rise on the Coast of Florida"

GARY ZARILLO, Florida Institute of Technology, presiding

8:00AM AOS-8 An Overview of the Greenhouse Effects Theory of Climate Change. HOWARD R. D. GORDON, Florida Community College, Kent Campus, 3939 Roosevelt Blvd., Jacksonville 32205. The atmosphere concentrations of several radiatively active gases have been increasing as a result of human activities. According to the greenhouse theory of climate change, the climate system will be returned to equilibrium by a warming of the surface troposphere and a cooling of the stratosphere. The predicted changes during the next decades, may exceed natural climate variations. The theory, its scope for verification, complexities of climate feedback mechanism, and the greenhouse effect on agriculture are discussed.

8:20AM AOS-9 Lifeboats Anchored in a Rising Tide. STEPHEN R. HUMPHREY, Florida Museum of Natural History, Univ. of Florida, Gainesville 32611. Global warming will make Florida warmer, wetter, and smaller, at rates of change higher than in past ice ages. Biotic communities will dissociate and form anew as species redistribute. Range limits will shift from Florida to the Piedmont or beyond. Saltmarsh will be vastly reduced; mangrove and tropical hardwoods will expand. Much of the Keys and coastal basins with little sediment will go under water. Interior wetland habitats will get wetter and displace one another upslope. Most animals' ranges will shift, but some plants will colonize too slowly to avoid extinction. Preserve-bound species unable to cross cultural landscapes will raise extinction rates far above recent levels. The scale of change will preclude pre-emptive preserve design. Preserves will fail their original purposes and be used for introduction of new biota.

8:40AM AOS-10 Sea Level Changes in Late Holocene Pre-Historical Time, Along the Florida Coast. W.F. TANNER, Geology Dept., Florida State Univ., Tallahassee 32306. St. Vincent Island, on the Florida Panhandle coast southwest of Tallahassee, has roughly 180 beach ridges (perhaps 12 sets), in a simple unambiguous map pattern. A plane table profile (topography) has been made across the island, and a linear suite of sand samples has been collected and analyzed. Certain sets stand high, others low. The vertical difference between any two such sets is a meter or more. Sample data have been smoothed by use of 3-point moving averages. The following grain size parameters identify ridge set boundaries: standard deviation, kurtosis, mean/kurt.,  $d(\text{StdDev})/dt$ , and  $dk/dt$ . Because each set represents a specific vertical position for two-to-four centuries, it cannot mark hurricanes. Therefore the differences between sets are taken to show small MSL lines. This interpretation matches precisely the known short-term changes in grain-size parameters due to observed hurricanes, except that the beach ridge data show long-term energy changes. The next natural change looks like a drop of 1-2 meters.

9:00AM AOS-11 Framework for Evaluating Impacts of Rapid Sea Level Rise (SLR) in Florida Rivers. E.D. ESTEVEZ, Mote Marine Laboratory, 1600 City Island, Sarasota, FL. Insight to the nature and extent of tidal river responses to a relatively rapid (ca. 100 cm/century) SLR can be gained from a review of known effects resulting from a slower (ca. 30 cm/century) rise, plus knowledge of geomorphic and salinity characteristics of specific rivers. A one meter SLR will drive salt-fronts several miles up most Florida rivers, and could stop or divert the flow of coastal springs--even with normal rainfall and evaporation. Of all river segments, tidal freshwater reaches (TFR) will be truncated most and TFR-associated wetlands and fauna will be reduced in area and number. Area and total production of the estuarine river downstream of the TFR will also decrease. Floodplain topography will prevent up-river translation of downstream habitats until floodplain forests are killed by salt intrusion and forest sediments are redistributed, probably by storms. Weather changes due to greenhouse effects, and diversions of flow for consumption will aggravate the acute and chronic impacts of rapid SLR in tidal rivers.

9:20AM BREAK

9:40AM AOS-12 Coral Reef Response To Sea Level Rise in the Western Atlantic and Caribbean, W.F. PRECHT and C.A. COLE, University of Miami: Rosenstiel School of Marine and Atmospheric Science, 4600 Rickenbacker Causeway, Miami, FL 33149. Eustatic sea level is expected to rise at an unprecedented rate within the next century, posing an interesting challenge to workers attempting to predict the responses of coral reef ecosystems to this increase. During the past 15,000 years of rising sea levels, coral reefs have left behind characteristic records which can be useful in interpreting reef histories relative to sea level history. The most probable consequences of rapid sea level rise (0.5-1.5 mm/yr) on reef ecosystems are that most reefs will either lag behind or founder. The ability of the reefs to recover or to reestablish will depend greatly on the rate of this rise over longer periods of time, and if the sea level change is accompanied by increases of ocean temperature, precipitation, terrestrial runoff, and nutrients.

10:00AM AOS-13 History and Prediction of Mangrove Response to Rising Sea Level in the South Florida Region, C.A. COLE and W.F. PRECHT, University of Miami: Rosenstiel School of Marine and Atmospheric Science, 4600 Rickenbacker Causeway, Miami, FL 33149. Holocene mangroves have exhibited one of three responses to rising sea levels. The first order response, during a slow rise, involves persistence through vertical accretion of mangrove peat, enabling the community to maintain the spatial position, and occurs in areas dominated by freshwater runoff. The second order response, during an intermediate rise, involves landward retreat and retainment of community zonation. In the third order response, during a rapid rise, mangroves are overstepped, as evidenced by a sudden landward relocation of the mangrove shoreline. It is anticipated that if the rate of rise exceeds (0.2 mm/yr), or freshwater runoff is reduced due to decreased precipitation, a large portion of southern Florida's mangroves would be overstepped during the next century.

10:20AM AOS-14 Local Shoreline Change from the Florida Map Digitization Program. W.F.TANNER AND S.DEMIRPOLAT, Geology Dept., Fla. State Univ., Tallahassee, 32306. Coastal map digitization for Florida has produced a detailed map (1:24,000) of almost all parts of the state's shores, showing positions of the coastline from every available accurate map, as well as changes with time. The Intergraph 68000 system was used. Source maps date from 1855 to 1985. The confirmed mean digitizing AND operator error was 1.5 m in the field. Various additional studies can be based on this new data bank. (1) Differences in near-shore bathymetry can be used to explain changes in long-term surf-zone wave energy density. (2) These changes provide information about probable future changes in erosion rates. (3) Detailed local histories can be produced. An example of the latter is the evolution of Johnson Shoal, a natural feature offshore from Lee County. The shoal has been migrating shoreward at measurable rates, and has also supplied the sand for construction of a distinctive cuspatate beach ridge plain on the seaward side of LaCosta Island. This history helps provide a better explanation of beach ridge plain growth.

10:40AM AOS-15 High-Precision Study of Shoreline Changes. S.DEMIRPOLAT, W.F.TANNER, H.ORHAN, Geology Dept., AND M.A.KNOBLAUCH, Inst.of Science and Public Affairs, Fla. State Univ., Tallahassee, 32306. The Intergraph 68000 was used to trace the shoreline for each Florida coastal county, using (typically) 4 to 6 maps in the age range 1855-1985. Control for each map was 4 or more longitude-latitude points. Lagoon, estuary and mainland features (which do not change significantly in decades) were used to detect source-map errors; many were found, and in a few cases the entire source-map had to be discarded. Mean digitizing and operator error was about 1.5 m in the field. Beach profiles by the Fla. Dept. of Natural Resources (since 1972) and black-and-white aerial photos were also used. The finished maps (for 14 counties) showed 4-6 historical shoreline positions, at scales of 1:24,000 and 1:2,400. This work created a data base containing much more information than can be shown on these maps; it opens a new research field which we are now beginning to exploit. This permits changes in bathymetry to be used to calculate probable changes in near-shore wave energy density, and resultant effects on beach erosion.

11:00AM AOS-16 The Rainfall Pattern of East Coast Central Florida. R. P. HAVILAND, Minilab Instruments, 1035 Green Acres Circle, 32019. The rainfall data for eastern Volusia County is assembled from several sources to provide a data base of over 100 years duration. Rainfall probabilities are developed for durations of 5 minutes to 10 years. The wet season-dry season characteristic is established. Probabilities are developed for largest and smallest annual rains, and for longest expected drouths. The correlation with rainfall of adjacent coastal counties is studied. Tropical storm occurrence is investigated, with indication of a common-rare cycle being present. The rainfall increase of such storms is evaluated. The unusual storm of 1924 is reviewed. Correlation of area rainfall with solar activity is investigated, with some indication of a climatic correlation. Items for further study are suggested.

BIOLOGICAL SCIENCES

FRIDAY 8:00 AM G-103

SESSION A: Fish Biology

C. GILBERT, Florida Museum of Natural History, presiding

8:00AM BIO-1 Range Extension of Blackchin Tilapia within the Indian River Lagoon System, Florida. N.A. FUNICELLI. U.S. Fish and Wildlife Service, 7920 N.W. 71st Street, Gainesville, Florida 32606. D.R. JOHNSON. University of Florida, Department of Fish and Aquaculture, 7922 N.W. 71st Street, Gainesville, Florida 32606. D.A. MEINEKE. U.S. Fish and Wildlife Service, 7920 N.W. 71st Street, Gainesville, Florida 32606. Blackchin tilapia distribution has been documented from the Tampa Bay area and from the southern tip of Merritt Island to south of Canova Beach (27 km). Blackchin tilapia ranging from 156-195 mm were caught in trammel net sampling in the waters surrounding Merritt Island National Wildlife Refuge in 1987 and 1988. Twenty-eight individuals were landed north of the NASA causeway doubling the species east coast range by 30 km. They were taken in salinities from 9 to 24 ppt and temperatures from 25 to 32 C. Water depths were 0.4 to 0.5 meters with soft mud or mud-sand substrates. Winter temperatures may limit northward expansion of the species.

8:15AM BIO-2 The Effect of Hydrilla Control by Grass carp on Lake Limnology. J.A. OSBORNE, R. SLEISTER, J. WOJEIAK, D. SCHMITZ AND S. SCOTT. Dept. of Biological Sciences, University of Central Florida, P.O. Box 25000, Orlando, Florida. After stocking grass carp at 20 fish/metric ton fresh weight hydrilla in March, 1981, hydrilla was controlled in Little Lake Barton in August of that year. The lake was monitored during 1977 and 1983 at six stations per month to document change in physical, chemical and biological parameters. Hydrilla had been eliminated from the lake 16 months prior to the 1983 sampling year. The before-after effects include an increase in orthophosphate, turbidity, chlorophyll(a), and hypolimnetic dissolved oxygen and a decrease in nitrite and nitrate nitrogen, specific conductivity, total alkalinity and visible light penetration. The benthic macroinvertebrate community experienced a reduction in species diversity, number of species, and number of individuals.

8:30AM BIO-3 A Comparison of Growth Between Captive and Free Nurse Sharks, *Ginglymostoma cirratum*. JEFFREY C. CARRIER (1) AND CARL A. LUER (2), (1) Dept. of Biology, Albion College, Albion, MI 49224, (2) Mote Marine Laboratory, 1600 City Island Park, Sarasota, FL 34236. Growth rates determined from recapture of free-ranging nurse sharks (*Ginglymostoma cirratum*) averaged  $13.1 \pm 9.5$  cm/yr and  $2.3 \pm 1.3$  kg/yr. Growth measurements on three captively maintained nurse sharks averaged over a three-year period, resulted in growth rates which were slightly faster ( $19.1 \pm 4.9$  cm/yr and  $4.0 \pm 1.7$  kg/yr). The captive study, however, revealed that growth rates decreased as the age of the animals increased (from approximately three to six years of age). Estimation of growth in the captive population at times when animals were of similar size as those tagged in the wild resulted in growth rates which were considerably closer ( $13.8 \pm 2.3$  cm/yr and  $3.7 \pm 2.2$  kg/yr). Percent changes in total length for free-ranging nurse sharks and captive nurse sharks of similar size were 11.4%/yr and 11.3%/yr, respectively, while percent changes in body mass averaged 32.7%/yr for recaptured animals compared with 31.6%/yr for comparably sized nurse sharks in captivity.

8:45AM BIO-4 Tracking and Survival Assessment of Recreationally Caught and Released Blue Marlin. R.E. EDWARDS AND J.F. GORZELANY, Mote Marine Laboratory, 1600 City Island Park, Sarasota, FL 34236. In order to assess short-term survival of recreationally caught and released blue marlin (*Makaira nigricans*), a tracking project (sponsored by the South Atlantic Fishery Management Council) was performed out of St. Thomas, USVI during September, 1988. Tracking was accomplished by attaching an ultrasonic transmitter tag to a marlin that had been caught by rod and reel, releasing the fish, and following the acoustic signal from a tracking vessel equipped with directional hydrophones and sonic receivers. Six successful trackings, ranging in duration from 2.2 to 6.0 hours, were achieved in a twelve-day period. The tracked blue marlin followed courses that were generally to the north but included movements to the east and west. All six of the marlin were judged to be healthy and behaving relatively normally at the termination of tracking.

9:00AM BIO-5 THE DEVELOPMENT OF A FISHERIES INDEPENDENT MONITORING PROGRAM IN FLORIDA'S ESTUARIES. McMichael, R.H., Jr., K.A. Killam, Ben J. McLaughlin. Florida Marine Research Institute, 100 8th Avenue, S.E., St. Petersburg, FL 33701-5095. The Florida Department of Natural Resources, Marine Research Institute recently began a fisheries independent monitoring program for juvenile fish in estuarine waters. The overall goal of the program is to determine relative abundance of juvenile fish through time. Additionally, this program, with several years of data, may be able to correlate juvenile abundance to future adult landings, and predict future year class strength. The program was initiated in Tampa Bay and has now been expanded to include Charlotte Harbor, Indian River, and Apalachicola Bay. Gears used include seines, trawls, gill nets, purse nets, drop nets, and pound nets. Each bay system will be stratified by habitat and randomly sampled within each habitat type. When the program is fully funded all coastal waters of Florida will be sampled with the support of eight field labs.

9:15AM BIO-6 Biochemical Systematics of the Fundulus majalis - F. similis species complex (Pisces: Cyprinodontidae). C.F. DUGGINS (1), K. RELYEA (2) AND A.A. KARLIN (3), (1) Dept. of Biology, Univ. of South Carolina, Columbia 29208, (2) Dept. of Biology, Wesleyan College, Macon, GA 31297, (3) Univ. of Arkansas, Little Rock 77204. The Fundulus majalis - F. similis species complex ranges from New England to Mexico along the Atlantic and Gulf of Mexico coasts, and disjunctly in Yucatan. Of especial concern is the taxonomic status of nominal F. majalis and F. similis. Relyea's (1983) morphological analysis indicated that these forms are conspecific and that there is a sharp clinical gradation from the more northern majalis to the southern similis in NE Florida. Our biochemical studies of isozyme variation confirm these conclusions. Emphasis is placed on data for NE Florida which show sharp gradients in isozyme allele frequencies and which parallel the gradients observed for morphological traits.

9:30AM BIO-7 Biochemical Systematics of the Fundulus grandis - F. heteroclitus species complex (Pisces: Cyprinodontidae). C.F. DUGGINS (1), K. RELYEA (2) AND A.A. KARLIN (3), (1) Dept. of Biology, Univ. of South Carolina, Columbia 29208, (2) Dept. of Biology, Wesleyan College, Macon, GA 31297, (3) Univ. of Arkansas, Little Rock 77204. Fundulus grandis ranges from NE Florida to Mexico along the Atlantic and Gulf of Mexico coasts, and disjunctly in Cuba where it has been recognized as F. g. saquarus. Relyea (1983) suggested that, on the basis of morphological traits, Florida Keys populations should be included in F. g. saquarus. Our studies of isozyme variation show no difference in isozyme allele frequencies between Florida keys populations and other F. grandis. Recognition of subspecies is questioned, but Cuban material remains to be examined. Fundulus grandis and F. heteroclitus are distinct at a specific level based on isozyme analysis.

9:45AM BREAK

FRIDAY 10:00 AM G-103

SESSION B: Marine Ecology

G. W. PATTON, Mote Marine Laboratory, presiding

10:00AM BIO-8 Earliest Stranding Record of *Ziphius cavirostris* for Florida's Lower West Coast (Charlotte Harbor to Key West). G.W. PATTON, R. MCKEOWN AND R. DELYNN, Mote Marine Laboratory, 1600 City Island Park, Sarasota, FL 34236. Investigation of a citizen's recollection of a stranding event (winter of 1939-40) led to the documentation through film records and skeletal material of a previously-unreported *Ziphius cavirostris* stranding. Standard measurements on the 910.5 mm skull and the presence of unerupted mandibular teeth showed the animal was a female possibly in excess of 6 m. U.S. Weather Service records included a pair of strong storms matching the citizen's recollections, thereby ascribing February 18, 1940 to the stranding event. This is the second record of strandings occurring in temporal and geographic proximity of the nine historic *Z. cavirostris* records. This species' social patterns may increase the likelihood of one stranding being followed by a second elsewhere along a coast. Special alerts may be warranted following strandings by some species.

10:15AM BIO-9 Aerial Studies of the West Indian Manatee (*Trichechus manatus*) from Anna Maria to Northern Charlotte Harbor and the Myakka River. P. NABOR AND G.W. PATTON, Mote Marine Laboratory, 1600 City Island Park, Sarasota, FL 34236. Low altitude, intensive manatee surveys have been conducted for nearly four years in the area from Anna Maria Island ( $27^{\circ}32.5'$ ) to Venice ( $27^{\circ}03'$ ) and for almost two years in the area south of Venice to northern Charlotte Harbor ( $26^{\circ}43'$ ) including the Myakka River. Eighty-two surveys resulted in 1,245 sightings totaling 2,695 animals, 10.9% being calves. Few manatees were sighted in January and February due to low water temperatures; peak counts were in September and October. Manatees are more abundant in the southern portions of the survey area. Several critical sites of regular or recurring manatee use have been identified. Based on the findings from this study, alternatives for protection including establishment of sanctuaries, channel-exempt no wake or slow speed zones throughout the inland waters, and maximum speed limits for channels, are currently being developed.

10:30AM BIO-10 Local Biogeography of Red Mangrove Arboreal Folivory in Southern Pine Island Sound, Lee County, Florida. J.W. BEEVER III (1) AND D.S. SIMBERLOFF (2), (1) South West Florida Aquatic Preserves, P. O. Box 591, Bokeelia 33922, (2) Florida State Univ., Tallahassee 32304. Red mangrove, Rhizophora mangle, foliage herbivores are a seldom recognized component in south Florida estuarine ecosystems. A study of local distribution of herbivores, their leaf damage, parasitism of herbivores and predation on herbivores reveals complex patterns of reciprocal distribution of the most abundant herbivore species the mangrove tree crab, Axius pisonii and the mangrove skipper, Phocides pygmalion. Parameters studied in 1978 are again examined to determine the stability of the distributional pattern.

10:45AM BIO-11 Notes on Hippolytid Cave Shrimps in the Bahamas (Crustacea: Hippolytidae). MARY FAHNING BROOKS, Dept. Bio. Sci., Florida Atlantic Univ., Boca Raton 33433. Two species of closely related Hippolytid shrimps inhabit the submarine caves (Blue Holes) located off the south shore of Grand Bahama Island, Bahamas. A range extension is provided for Somersiella sterrei and a new distribution is reported for Janicea antiquensis. Behavior patterns and biogeographical considerations are discussed.

## 11:00AM BUSINESS MEETING

FRIDAY 1:30 PM G-101

PLENARY SESSION I: Florida Academy of Sciences  
MARVIN IVEY, Hammond and Holmam, P.A., presiding

FRIDAY 3:00 PM G-103

SESSION C: Physiology and Embryology  
T. C. SNELL, University of Tampa, presiding

3:00PM BIO-12 Ultrastructural and Light Microscopic Detection of Induced Phenolic Compounds in Cortical Cells of Endomycorrhizal Roots of Bahia Grass. D. A. STOCK, AND J. L. GIBSON, Dept. of Biology, Stetson Univ., DeLand, FL 32720. Roots of bahia grass (*Paspalum notatum* L.) colonized by the endomycorrhizal (symbiotic) fungus, Glomus intraradices Smith & Schenck (Zygomycetes), were examined with both transmission electron and compound light microscopy. With electron microscopy, peculiar structures were detected in the tonoplast of the colonized cortical cells, but not in uncolonized cortical cells. These structures are globular and dark-staining with normal ultrastructural post staining methods (uranyl acetate and lead citrate) and are termed tanninlike bodies. Using light microscopy and staining procedures specific for phenolic compounds, we believe they are phenolic compounds elicited by the invasion of the fungus into the cortex.

3:15PM BIO-13 The Effect of Arm Number on Gonad Production in Luidia clathrata (Echinodermata: Asteroidea). J. LAWRENCE, University of South Florida, Tampa 33620. One group of adult (R ca. 7 cm) L. clathrata with intact arms and one group with two arms amputated at the disc were fed equal amounts of food (0.28 g dry flesh weight/individual/week of the bivalve *Donax variabilis* from February through April. The Radius of intact arms did not change in either group and their weights were similar. Regeneration of the amputated arms was minimal (ca. 4 mm). The weight of the gonads in a single arm increased an equivalent amount in each group. The weight of the pyloric caeca in a single arm was similar and did not change in either group. Because of the greater number of arms, the total gonad and pyloric caeca weights were greater in the individuals with intact arms. Arm number does not affect gonad production in individual arms, but does result in different amounts of total gonad production in L. clathrata at this level of feeding. Gonad production takes precedence over pyloric caeca production and arm regeneration.

3:30PM BIO-14 Isolation and Characterization of the Enzyme Glutathione S-transferase from Two Rotifer Species. B. BOWMAN, T.W. SNELL, Division of Science, University of Tampa, Tampa, FL 33606 and B.J. COCHRANE, Dept. of Biology, University of South Florida, Tampa, FL 33620. Standardized bioassays using rotifers of the genus *Brachionus* are important tools in assessing aquatic toxicity. The sensitivity of *B. plicatilis*, a brackish and marine species, to chlorinated phenols is less than its freshwater congener *B. calyciflorus*, with LC<sub>50</sub>'s for sodium pentachlorophenate (PCP) of 1.36 and 0.62 mg l<sup>-1</sup>, respectively. The relative detoxification capabilities were compared by examining the production and relative activities of their glutathione S-transferases (GST; E.C. 2.5.1.18), an enzyme important in phase II detoxification of chlorinated hydrocarbons. GST was isolated and purified from crude post-mitochondrial homogenates by affinity chromatography. A spectrophotometric GST assay was then performed on the eluents for each species and specific activities were calculated. SDS-PAGE revealed three GST subunits in both species ranging from 23 to 26 kd in size. Native PAGE indicated 4-6 isoforms in each species. GST activity staining showed all isoforms possess transferase activity. Enzyme inducibility was also examined by exposing populations of each species to increasing concentrations of 1-chloro 2,4-dinitrobenzene (CDNB) and determining GST levels.

3:45PM BIO-15 Calcium Source for Protoconch Formation in the Florida Apple Snail: More Evidence for Physiological Plasticity in the Evolution of Terrestrial Eggs. C. M. NORLUND AND R. L. TURNER, Florida Institute of Technology, Melbourne 32901. The calcified capsule of terrestrial eggs of several gastropods is known to provide calcium as well as structural support for the embryo. Atomic absorption spectroscopy was used to measure calcium concentration in newly oviposited eggs and hatchlings of *Pomacea paludosa* to determine changes in calcium content during development. The calcium content of intracapsular material does not, however, change during embryogenesis. There is little erosion of the capsule evident by scanning electron microscopy. Initial intracapsular calcium concentration is 690 mM, far higher than values reported for other gastropods. Reliance of the embryo on intracapsular, rather than capsular, stores of calcium for protoconch formation is a strategy not recognized before among gastropods but is one that has a parallel among squamate reptiles. Supported in part by a Sigma XI Grant-in-Aid of Research to CMN.

4:00PM BREAK

4:15PM BIO-16 The Effect of Stress and Disturbance on Proximate Composition and Allocation of Production in *Hygrophila polysperma* (Roxb.) Anders. J. P. KURDZIEL, R. BOWMAN, C. KOVACH, J. WAGNER, AND J. LAWRENCE. University of South Florida, Tampa 33620. Emerged apical shoots of submerged *H. polysperma* were collected in October 1988 and grown under controlled laboratory conditions. Stressed plants were grown in soil with low nutrient levels; disturbed plants were cropped of leaves. Stressed and disturbed plants grew longer, had more internodes, and a higher shoot/root ratio than control plants. The number and dry weight of developed leaves and the number of internodes did not differ among the groups. Stressed and disturbed plants had a higher concentration of protein and soluble carbohydrate in their roots than control plants. The response of *H. polysperma* did not fully conform to the predictions of the C-S-R system for competitive plants.

4:30PM BIO-17 The Effect of Stress and Disturbance on Photosynthesis, Respiration, and Chlorophyll Levels in *Hygrophila polysperma* (Roxb.) Anders. C. KOVACH AND J. LAWRENCE, University of South Florida, Tampa 33620. Emergent apical shoots of submerged *H. polysperma* were collected in October 1988 and grown under controlled laboratory conditions. Stressed plants were grown in soil with salt or low nutrient levels; disturbed plants were cropped of leaves. Plants under both types of stress had significantly lower levels of photosynthesis than control or disturbed plants. Respiration, photosynthesis/chlorophyll a, and the chlorophyll a/chlorophyll b ratio did not differ among the groups. Chlorophyll levels were lower in stressed plants than in control or disturbed plants. Stress causes a decrease in photosynthesis while disturbance does not, except on an absolute basis.

4:45PM BIO-18 Ontophylogenetics of Cantharoid Larviforms. J. M. CICERO, Dept. of Entomology and Nematology, 3103 McCarty Hall, University of Florida, Gainesville 32611. "Ontophylogenetics" is coined because it encompasses studies on the evolution of life cycles more precisely than does the phrase "ontogeny and phylogeny". Larviforms are concluded to be adult insects that quit the pharate pupal stage of metamorphosis earlier than their males because of differences in their endocrine systems. An ontophylogenetic character analysis, developed from studying larviforms, is applied to adults and larvae of other beetles, showing that quitting time for the both the embryonic and pharate pupal stages varies markedly among Coleoptera. The result of such variation is that duration of differentiation in descendant life cycle is shortened or prolonged relative to the ancestral life cycle. If, for example, embryogenesis is prolonged during speciation, then the first instar of one species will be more imaginal than that of a more primitive species.

FRIDAY 6:30 PM SHERATON JACKSONVILLE BEACH  
SOCIAL

FRIDAY 7:30 PM SHERATON JACKSONVILLE BEACH  
BANQUET AND PLENARY SESSION II  
FLORIDA ACADEMY OF SCIENCES

FRIDAY 3:00 PM G-104  
SESSION D: Terrestrial Ecology  
J. A. RODGERS, Fla. Game & Fresh Water Fish Comm., presiding

3:00PM BIO-19 Nests and Day Refuges of Two Sympatric Rodents in Florida. P. A. FRANK (1) AND J. N. LAYNE (2), (1) Dept. of Wildlife and Conservation, Univ. of Florida, Gainesville, 32611, (2) Archbold Biological Station, P.O. Box 2057, Lake Placid, 33852. Day refuge selection, patterns of refuge use, and nest construction of two sympatric rodents, the cotton mouse (*Peromyscus gossypinus*) and golden mouse (*Ochrotomys nuttalli*), were studied at the Archbold Biological Station in south-central Florida. Radiotelemetry was used to locate mice in their day refuges during summer 1987 and winter 1988. Cotton mouse refuges were usually located in gopher tortoise (*Gopherus polyphemus*) burrows although some tree cavities and ground holes were used. Golden mouse refuges consisted of spherical nests found almost exclusively at ground level below the leaf litter. The two species differed in spatial patterns of refuge use; cotton mice exhibited greater refuge areas, distances between refuges, and used a greater number of refuges than golden mice. Temporal patterns of refuge use were generally similar for both species; mice used fewer refuges, spent less days per refuge, and changed refuges less frequently in winter than summer. Seasonality in nest construction was evident for both species, with more substantial nests being constructed in winter. Seasonality in the type of refuge selected was not found. Factors affecting refuge selection in these species are discussed.

3:15PM BIO-20 Fire and the Florida mouse (*Podomys floridanus*). CHERI A. JONES, Department of Zoology, 223 Bartram Hall, University of Florida, Gainesville 32611. The Florida mouse, *Podomys floridanus* (Muridae), is the characteristic mouse of the longleaf pine-turkey oak sandhills of northern Florida. The sandhills (also known as high pineland) are pyrogenic communities once subjected to frequent fires. However, little is known about the effect of fire on *Podomys*. I examined reactions of three populations of *Podomys* to prescribed burns on the Katharine Ordway-Swisher Memorial Sanctuary in Putnam County. There was little or no mortality due to these fires, and populations were higher on burned areas than on unburned sites.

3:30PM BIO-21 Vertebrates associated with gopher tortoise (*Gopherus polyphemus*) burrows in four habitats in south-central Florida. KAREN R. LIPS and JAMES N. LAYNE, Archbold Biological Station, Lake Placid 33852. Eighty gopher tortoise burrows were funnel trapped biweekly in four habitats on the Archbold Biological Station, Highlands County, from August 1987 through June 1988. A total of 319 individuals representing 16 amphibian, reptilian, and mammalian species was trapped. Habitat ranking in order of number of species recorded from burrows was: burned scrubby flatwoods (12) > sand pine scrub (11) > slash pine-turkey oak (10) > unburned scrubby flatwoods (5). Based on total number of individuals of all species captured, habitat rankings were: slash pine-turkey oak (139) > sand pine scrub (97) > burned scrubby flatwoods (45) > unburned scrubby flatwoods (37). The catch in fall (Sept. - Nov.) was significantly higher than either winter (Dec. - Feb.) or spring (March - June). Large burrows (> 23 cm diameter) had significantly more captures than small burrows, and active burrows had significantly more captures than inactive burrows. The intensity of use of gopher tortoise burrows by other vertebrates indicates that the gopher tortoise may contribute significantly to the diversity and abundance of small vertebrates in those habitats in which it occurs.

3:45PM BIO-22 Implications of the Jacksonville-Tampa toll road for the protection of biodiversity in north Florida. C. KENNETH DODD, JR. (1) AND RICHARD FRANZ (2), (1) National Ecology Research Center, U.S. Fish and Wildlife Service, 412 N.E. 16th Ave., Gainesville 32601, (2) Florida Museum of Natural History, University of Florida, Gainesville 32611. Recent plans showing possible corridors for a multi-lane highway and high speed rail corridor across environmentally sensitive lands in north Florida, including the 3750 ha Katharine Ordway Preserve-Swisher Memorial Sanctuary in Putnam County, have serious consequences for efforts to preserve biodiversity. These include the destruction of a biological reserve, alteration of wetlands and uplands habitats, and the disruption of wildlife corridors. The design could set a precedent for the appropriation of wildlife corridors and reserves as transportation corridors. Significant ecological losses are foreseen as habitats are fragmented by new highways.

4:00PM BIO-23 Responses of Sixteen Species of Foraging Waterbirds to Increasing Levels of Applied Human Disturbance. MARY L. KLEIN, Dept. of Wildl. and Range Sci., Coop. Fish and Wildl. Res. Unit, Univ. of Fla., Gainesville 32611. The last 20 years have seen a dramatic rise in the number of people visiting wildlands. The "Ding" Darling NWR on Sanibel Island has been heavily impacted, with visitation exceeding a half million people in 1987-88. Visitors are concentrated in a small area along a 5 mile dike that serves as a road through the Refuge. With the concern that high visitation levels are negatively impacting waterbirds, a comprehensive study was conducted to examine foraging distributions, human activity patterns and bird responses to specific human actions. Randomly selected individuals from sixteen species of waterbirds were subjected to five levels of human disturbance ranging from a "drive by" to approach on foot. The birds' responses fell into five categories from no observed response to actual flight. All species except the great egret, snowy egret, green-backed heron, yellow-crowned night-heron, and American wigeon showed significantly more intense behavioral responses to increased levels of disturbance (Chi-square,  $P<0.05$ ). Of the non-significant species, all showed trends towards more intense response. Also, the snowy egret, the green-backed heron, and the American wigeon all showed strong human avoidance at all levels. Disturbance response to noise varied by species. Relationships of these responses to actual visitor behavior, and management implications are considered.

FRIDAY 6:30 PM SHERATON JACKSONVILLE BEACH  
SOCIAL

FRIDAY 7:30 PM SHERATON JACKSONVILLE BEACH  
BANQUET AND PLENARY SESSION II  
FLORIDA ACADEMY OF SCIENCES

SATURDAY 8:30 AM G-103

SESSION E: Botany

D. B. WARD, University of Florida, presiding

8:30AM BIO-24 A SEM Study of Pollen Exine Development in *Hibiscus tiliaceus*. C. C. SMITH, S. D. SCHAFER, AND M. R. VOISIN, Eckerd College, St. Petersburg 33733. *Hibiscus tiliaceus* flower buds 8-35 mm long provide developmental stages from the tetrad to mature pollen. Smooth microspores enlarge as they separate from the tetrad and become irregularly shaped with a few spheroidal sporopollenin deposits. The surface (foot layer) then becomes densely covered with deposits that form the columellar layer, spines with a prominent basal cushion of columellae, and the tectum. As the pollen matures, it becomes larger, less rugose, and heads of the columellae fuse to form a tectum that obscures the spirally arranged pores. Mature spheroidal pollen of *Hibiscus tiliaceus* is polyporate and ornamented with spirally arranged, unbranched spines and a granulose tectum surface.

8:45AM BIO-25 A Scanning Electron Microscope Study of *Hibiscus tiliaceus* Pollen. K. A. ACOL AND G. E. LOEBEL, Eckerd College, St. Petersburg 33733. Mature pollen of the tropical mallow tree, *Hibiscus tiliaceus* (mahoe) is observed with the scanning electron microscope and compared with pollen of the mallow family (Malvaceae), and specifically, pollen of the woody, ornamental shrub, *Hibiscus rosa-sinensis*. Typically, mallow pollen is polyporate, spheroidal, tectate, and has spirally arranged spines. Distinguishing features of *H. tiliaceus* pollen are its colporate pores that have a thickened annulus, and thin, conical spines with a prominent basal cushion of columellae. *Hibiscus rosa-sinensis* is characterized by its large polyporate pollen, spines with rounded ends and bulbous bases, and pores with annuli in a very thick endexine.

9:00AM BIO-26 Ovuliferous Scale Development in Cones of *Pinus elliottii* var. *elliottii* Engelm. R. F. Mente and S. D. Brack-Hanes, Eckerd College, St. Petersburg 33733. To date, there is no descriptive study of conifer ovuliferous scale development. This is important information for interpreting the fossil record of conifers and understanding their ancestry. Mature and juvenile stages of cones and cone fragments are found isolated in ancient sediments. Therefore, this ontogenetic study of cone scales in *P. elliottii* var. *elliottii* Engelm. was initiated with special emphasis on the development of two prominent scale features, the apophysis and umbo. In this species, the two structures do not develop until the third year and during all growth stages, they are broader than thick. Differential growth on the apophysis' adaxial side displaces the umbo dorsally.

9:15AM BIO-27 Fine Structure of the Ascus and Ascospore Formation in the Cup Fungus, Geopyxis carbonaria. J. L. GIBSON, Dept. of Biology, Stetson Univ., DeLand, FL 32720. Geopyxis carbonaria is a species of cup fungus (Ascomycetes: Pezizales) of temperate Northern Hemisphere distribution commonly found on burned sites. This species has eight spores per ascus, the usual number for Ascomycetes. The structure of the ascus and formation of the ascospores are studied using transmission electron microscopy supplemented by compound light microscopy. Ascus observations emphasize the structure of the ascus apex, which is important in ascospore discharge. Changes in ascus wall chemistry during development are indicated with the silver proteinate cytochemical staining procedure. Observations of ascospores include spore initiation from ascus cytoplasm, primary wall formation, and secondary wall formation resulting in the characteristic morphological pattern.

9:30AM BIO-28

Systematics and phytogeography of Mecranium (Meliastomataceae: Miconiac). JAMES D. SKEAN, JR., Department of Biology, Albion College, Albion, MI 49224. The genus Mecranium Hook. f. comprises 23 species (27 taxa) of montane shrubs and small trees endemic to the Greater Antilles and their satellite islands. Species of Mecranium have axillary inflorescences, 4-merous flowers, and are differentiated from species of the genus Sagraea DC. by an erose or ciliate fringe of hairs located internally at the bases of the stamens, external calyx lobes reduced to minute teeth, and loss of strigose and thick-walled glandular indumentum. Mecranium includes Ossaea acuminata DC. and Ekmaniocharis crassinervis Urb., and is composed of two sections. Section Sagraeoides is a primitive group comprising two Hispaniolan species. Section Mecranium is characterized by the presence of a calyptra formed from fusion of the internal calyx lobes, and obovate petals with rounded, retuse apices. The genus has centers of diversity in the Massif de la Hotte of Haiti (9 spp., 7 endemic), the Massif de la Selle-Sierra de Baoruco of Hispaniola (6 spp., 2 endemic), the Cordillera de Guaniganico of Cuba (3 spp., 2 endemic), and the Blue Mountains of Jamaica (3 spp., 1 endemic).

9:45AM BREAK

10:00AM BIO-29 Reproductive Biology of the Small-Flowered PawPaw (Asimina parviflora). E.M. NORMAN, K. RICE AND S. COCHRAN, Dept. of Biology, Stetson University, DeLand 32720. Field observations and experiments in c. Florida determined phenology, pollination, breeding system and germination of Asimina parviflora. This species is in anthesis from mid-February to the end of March. The protogynous flowers have occasional overlaps in pistillate and staminate phases. Small Diptera are the main visitors to the flowers. Bagged flowers occasionally self-pollinate (6.8% in 1984). In open-pollinated flowers, 3.2% set fruit in 1984 and 4.5% in 1987. Hand-pollination yielded 16% fruit set in 1984 and 24% in 1987 when xenogamy was effected; 10.4% (1987) when autogamy or geitonogamy was induced. Seed sample from the former group yielded 17.5% germination (1987); no seed germinated from the inbred sample.

10:15AM BIO-30 Analysis of Quercus virginiana complex in southeast Florida (Fagaceae). TERESA POPPEMA, Dept. Bio. Sci., Florida Atlantic University, Boca Raton 33431. Quercus virginiana, Q. minima, and Q. geminata are demonstrated as separate species through a variety of morphological features. Cladograms derived by PAUP and phenograms by UPGMA re-inforce them as separate species.

10:30AM BIO-31 Introgressive hybridization in Quercus (Fagaceae). MARY FAHNING BROOKS, Dept. Bio. Sci., Florida Atlantic University, Boca Raton 33431. Quercus X rolfssii and its purported parents, Q. minima and Q. chapmanii, were examined to determine what relationships, if any, exist among them. Previous authors have considered Q. chapmanii with enough variability to include all possible Q. X rolfssii. Numerous traits suggest that backcrossing has occurred with Q. chapmanii. Yet, some specimens exhibit spines and lobing, possibly indicating a genetic contribution from Q. minima.

10:45AM BIO-32 Variability studies of Quercus myrtifolia (Fagaceae). MARY HOEFS, Dept. Biol. Sci., Florida Atlantic University, Boca Raton 33431. The literature states that Quercus myrtifolia displays entire and glabrous leaves but in southeastern Florida they show lobing, spines and reddish pubescence. The question examined was whether this variability was due to hybridization or phenotypic plasticity. A variety of morphological characters were analysed using the computer programs UPGMA and PAUP. There was appropriate separation of the species in the computer analyses as well as 100% consistency of pubescence characters in Q. myrtifolia. It was concluded that there is no hybridization between Q. myrtifolia and other species and that any lobing or spines are due to phenotypic variation.

11:00AM BIO-33 Intra-individual variation in Taxodium (Taxodiaceae). W. JAMES WHITLEY, Dept. Biol. Sci., Florida Atlantic University, Boca Raton 33431. Morphological characters historically used to distinguish pondcypress and baldcypress were examined. The differences between sun and shade samples reveal a high degree of intra-individual variation in Taxodium. According to classical taxonomy enough variability exists between sun and shade branches to place them in different taxa.

11:15AM BIO-34 Mangrove Forest Canopy Dynamics in Everglades National Park. J. R. STENBERG, South Florida Research Center, Everglades National Park, P.O. Box 279, Homestead, FL 33030. This is a preliminary study of the effects of small scale disturbances on forest canopy dynamics in the mangrove ecosystem of Everglades National Park. Results suggest that regeneration in small canopy gaps formed by lightning is dominated by Avicennia germinans and Rhizophora mangle, even though Laguncularia racemosa often dominates the mature overstory.

FRIDAY 8:00 AM G-104

SESSION F: Symposium

"Natural History of North Florida's Barrier Islands"

PAULA THOMPSON, Fla. Commun. Coll. at Jacksonville, presiding

8:00AM BIO-35 Nassau Sound: A Natural Landmark. ROBIN B. HUCK, Department of Natural Resources, Division of Recreation and Parks, State of Florida, 380 Semoran Commerce Place, Suite B-210, Apopka, FL 32703. Nassau Sound in Duval County is one of the last remaining undredged inlets on the east coast of Florida. Occurring at the merger of South Amelia and Nassau Rivers, this natural landmark of approximately 10,000 acres is a laboratory for benchmark studies of geomorphological, erosional and hydrological processes. To the north of the Sound is Amelia Island State Recreation Area and to the south are Big and Little Talbot Island State Parks. Within Nassau Sound, Bird Islands are low lying, sometimes vegetated sandy islands first described by French navigators in 1779 as Ile Sandy. The historical panorama of shifting natural change within Nassau Sound and the Bird Islands can be traced over a 200 year period in navigator and geologic maps.

8:15AM BIO-36 Bird Islands of Nassau Sound: A Critical Wildlife Area. PETER D. SOUTHALL, Florida Game and Fresh Water Fish Commission, Route 7, Box 440, Lake City 32055. Colonial beach nesting birds such as royal terns, least terns and black skimmers have experienced a loss of nest sites due to development and disturbance of coastal habitats. The dynamic sand islands in Nassau Sound, known as Big Bird and Little Bird Islands, provide essential nesting habitat for thousands of birds, including threatened and species of special concern. Human disturbance during the nesting period can greatly reduce reproductive success for these birds. In 1977, the Florida Game and Fresh Water Fish Commission established Bird Islands as a Critical Wildlife Area to prohibit man-caused disturbance from May 1 through August 31.

8:30AM BIO-37 Geology and Geomorphology of Talbot Island. FELICIA E. WEST, Florida Community College at Jacksonville, 501 W. State Street, Jacksonville 32202. Little Talbot Island is located on the Northeast Florida Coast between Ft. George and Amelia Islands. It is one of the few barrier islands on the eastern shores of the U. S. that remains undeveloped and unspoiled. General information regarding barrier islands, their structure and dynamics will precede a video tape of the general area around little Talbot Island. The tape will include views of the island as it was twenty years ago as well as aerial views of the island taken over the past three years.

8:45AM BIO-38 Archaeology of the Northeast Florida Barrier-Islands, Nassau-Duval-St. Johns Counties: An Historical Overview. J.H. SASSER, Florida Community College at Jacksonville, 3939 Roosevelt Boulevard, Jacksonville, Fla. 32205. Coastal barrier-island pre-columbian archaeological sites from those on Amelia Island to the area just north of St. Augustine are examined in terms of their development in relation to the environment on the islands through time. Typology and characteristics of the various sites is presented with emphasis on the artifactual and natural materials contained within the sites as well as exposition of the cultures that created and used the materials. Modern-day dangers to these sites are enumerated and described.

9:00AM BIO-39 Florida Park Service Resource Management Strategies. Robert Joseph, Park Manager, Little Talbot Island, DNR, 12157 Heckscher Dr., Fort George 32226. The FPS manages lands on five Northeast Florida barrier islands. The natural processes of sea meeting land are reflected in these islands with minimal human manipulation. Beach faces and inlet channels are allowed to yield and change under nature's forces as technological intervention is discouraged. Compare seaward dunes formed in the last hundred years to ridges formed during a previous sea level oscillation; estuarine tidal creeks, salt pans and salt marshes, to the shoals and deep water channels of Nassau Sound. Man has inhabited these islands from prehistoric times to the present. His reasons for being here and the cultures he brought have varied considerably. The FPS mission is to preserve these lands through Systems Management. Though classified as a passive form of Resource Management, a broad data base, awareness of subtleties in natural systems, as well as vigilance to man's most discreet impacts on these systems are critical to successful implementation of this holistic approach.

FRIDAY 1:30 PM G-101  
PLENARY SESSION I: Florida Academy of Sciences  
MARVIN IVEY, Hammond and Holman, P.A., presiding

COMPUTER SCIENCE AND MATHEMATICS

FRIDAY 9:00 AM N-233  
SESSION A  
DARYL SCHRADER, St. Petersburg Junior College, presiding

9:00AM CSM-1 Models for Course Scheduling, LYNN K. STEVENS AND JAY YELLEN, Operations Research Program, Florida Institute of Technology, 150 West University Blvd., Melbourne, FL 32901. Algorithms for scheduling courses to time periods and classrooms, minimizing student conflicts and considering faculty preferences, will be presented. The trade-off between exact integer programming methods and approximations using graph coloring will be discussed, and a number of examples provided.

9:15AM CSM-2 On Risk Aversion in Utility Theory. PAULO LOPES DA SILVA AND FREDERICK B. BUONI, Operations Research Program, Florida Institute of Technology, 150 W. University Blvd., Melbourne, 32901. In the theory of decision making under risk, risk aversion is associated with a concave utility function. We show that current definitions of risk aversion do not hold for the case of outcomes involving losses.

9:30AM CSM 3 An Analog Device Capable of Solving an Arbitrary Polynomial Equation. DAVID LAWSON, The Department of Mathematics/Computer Science, Stetson University, DeLand, FL 32720. The Dynamic Analytical Vector Engine, or DAVE, is an analog device capable of solving any polynomial equation. We describe the device and present a computer implementation of the machine.

9:45AM CSM-4 A New, Geometrical Method of Generating Prime Numbers. JAY STRYKER, The Department of Mathematics/Computer Science, Stetson University, DeLand, FL 32720. We Present a graphic, or geometric, method of generating prime numbers. Several interesting additional properties seem to result from the geometric relations involved. As an example, a simple extension of the method will yield a cartesian grid which has at coordinate (n,m) the greatest common factor of n and m.

10:00AM BUSINESS MEETING

FRIDAY 1:30 PM G-101

PLENARY SESSION I: Florida Academy of Sciences  
MARVIN IVEY, Hammond and Holman, P.A., presiding

ENGINEERING SCIENCE

SATURDAY 8:30 AM N-233

SESSION A

BETTY PREECE, Melbourne High School, presiding

8:30AM ENG-1 Improving Thermal Efficiencies in Methanol Compression Ignition Engines. F.J. FOSTER, D.E. HAHN, T.B. POST, Florida Institute of Technology, 150 W. University Blvd, Melbourne, 32901. Due to recent discoveries of the carcinogenic potential of particulate emissions from diesel fueled engines, the EPA has set a Federal Mandate that these particulates must be eliminated by 1994. The most promising solution is a conversion to methanol fuel. Methanol fuel exhibits desirable emission qualities. We propose to use waste heat, from the exhaust, to overcome the high heat of vaporization of methanol fuel. This is accomplished by preheating the incoming air charge to within autoignition range through a gas to gas heat exchanger. The increase in thermal efficiency will increase the overall fuel economy of the engine. We will present comprehensive engine designs, heat exchanger designs, and results of fouling factor studies.

8:45AM BUSINESS MEETING

ENVIRONMENTAL CHEMISTRY

FRIDAY 3:00 PM N-230

SESSION A

BARBARA MARTIN, University of South Florida, presiding

3:00PM ENV-1 Chemically-Reactive Sediment Probes. F. JOSEPH RINELLA AND R. DEL DELUMYEAE, Millar Wilson Laboratory for Chemical Research, Jacksonville Univ., Jacksonville 32211. The paper describes chemically-reactive probes that can be placed in the sediment for varying amounts of time. Ion-exchange resin is coated with a colorimetric reagent and formed into a probe. The reagents are species-specific for Fe, Pb, Cu or Zn. These cations were chosen for the initial study due to their biological significance in the monitoring of environmental pollutants.

3:15PM ENV-2 Nonpoint Source Phosphorus Control by a Combination Wet Detention/Filtration Facility. J.D. Holler, Smith and Gillespie Engineers, Inc., 7406 Manatee Street, Ste. 1, Sarasota, 34243. Water quality investigations were conducted to assess the treatment potential (concentration reduction) of a dual-component wet detention/filtration-berm stormwater management system, located in Kissimmee, Florida. Routine monthly data were collected to characterize prevalent ambient conditions. Six distinct storm events were monitored to characterize episodic phosphorus concentration variations during the period November, 1985 to November, 1986. Phosphorus concentrations were monitored at the influent channel, within the wet detention pond, and within a filtration-berm effluent collection box. Routine significant differences ( $p \leq 0.05$ ) existed between influent and detention pond sample results. However, no significant differences were shown between detention pond and filtration-berm effluent results. Mean storm event wet detention treatment potentials for orthophosphorus and total phosphorus were both 77%. Mean filtration treatment potentials were -91% and 16% for orthophosphorus and total phosphorus.

3:30PM ENV-3 Inhibition of the red tide organism, Ptychodiscus brevis, by the green alga, Nannochloris oculata. M. C. FLYNN, AND D. F. MARTIN, CHEMS Center, Dept. of Chem., Univ. of South Fla., Tampa 33620. Growth of the unarmored dinoflagellate (Ptychodiscus brevis) was inhibited in the presence of the green alga Nannochloris oculata. The inhibition of growth was a function of the number of N. oculata initially present in the mixed culture. That the inhibition was an example of allelopathy was indicated by removing N. oculata cells and adding different amounts of cell-free culture to P. brevis culture and noting that inhibition of growth still occurred. N. oculata response, while effective, appeared to be less effective than another isolate of Nannochloris, previously examined for organism-organism interaction. Environmental implications are considered.

3:45PM ENV-4 Determination of Formaldehyde in Urban Atmosphere. KAREN E. WRIGHT AND R. DEL DELUMYEAE, Millar Wilson Laboratory for Chemical Research, Jacksonville University, Jacksonville 32211. Formaldehyde is a natural component of the atmosphere and a known carcinogen. The urban concentration of formaldehyde is elevated due to anthropogenic sources such as production of paper products, and cigarette smoke. Another potential source is the use of methanol blended fuels, of which formaldehyde is a combustion product. The preliminary objective of the study is to determine a baseline concentration against which to measure future increases in urban aldehyde levels. The concentration of the formaldehyde will be determined in both urban air and in the exhaust of vehicles burning "gasohol" as fuel. Sorbent tubes will be used to collect formaldehyde as derivatives. The concentrations of extracts will be determined using gas and liquid chromatographic methods.

4:00PM BREAK

4:15PM ENV-5 Solid Phase Extraction of Red Tide Toxins. S. PROFFITT, A. DEROSSET, M. HENRY, AND R. PIERCE. Mote Marine Laboratory, 1600 City Island Park, Sarasota, FL 34236. The use of solid sorbents for extraction and recovery of toxins from red tide (*Ptychodiscus brevis*) culture was evaluated relative to the standard liquid/liquid extraction method using dichloromethane as the solvent. Two types of sorbent were tested: 50-200 mesh granulated coconut charcoal (Altech Associates); and 100-200 mesh silica bonded octadecane ( $\text{SiO}_2\text{-C}_{18}$ ; Fisher Scientific, PrepSep<sup>tm</sup>) particles. The  $\text{SiO}_2\text{-C}_{18}$  sorbent column proved to be superior to the charcoal for recovery efficiency and precision, and superior to the solvent extraction regarding recovery efficiency, analysis time, and removal of pigments that interfere with toxin analysis. Studies are continuing for evaluation of a prototype field sampler solid extraction system for processing large volumes of seawater containing red tide toxins.

4:30PM ENV-6 Anomalous Radon In Dade County. DONA GUSSOW AND HOWARD MOORE, Dept. of Chem., Florida International University, Miami 33199. A statewide radon study indicated an area of Dade Co. to be a potential source of elevated radon levels in buildings. The 1981 NURE study of South Florida also indicated elevated uranium levels. Recently one house has been found to have 38 to 48 pCi/L radon. This appears anomalous since carbonate deposits such as exist in Dade County are generally thought to be low in uranium and radon. Samples of the near surface aquifer have not shown elevated radon or radium levels. However, radium levels in one soil type have been found to be as high as 8 pCi/g soil. The uranium levels reported in the NURE study do not appear to be sufficient to support these levels of radium. These and other results will be discussed in an effort to explain the high radon potential.

4:45PM ENV-7 Blood Selenium in Select Mid-Income Florida Employees. FRANCIS L. CORDEN (1), NICHOLAS G. ALEXIOU (2), and DEAN F. MARTIN (1); (1) Chemical and Environmental Management Services (CHEMS) Center, Department of Chemistry, University of South Florida, Tampa 33620; (2) Department of Internal Medicine, College of Medicine, University of South Florida, Tampa 33620. Blood samples from 19 healthy, mid-income Floridians (5 females, 14 males) were collected and analyzed for copper, zinc, and selenium using atomic absorption spectroscopy. The mean ( $\pm$  1 S.D.) values were copper  $1.00 \pm 0.29$  ppm; zinc,  $0.86 \pm 0.19$  ppm; and selenium,  $132 \pm 29$  ppb. The mean selenium level for the females ( $n = 5$ ) was  $125 \pm 37$  ppb and  $132 \pm 31$  ppb for males ( $n = 14$ ). No significant difference was observed for the two groups. No correlation was observed between copper and zinc. The correlations between zinc and selenium appeared to fall into two groupings, and the correlation between copper and selenium appeared to be slightly negative. These are among the relatively few data that have been collected for selenium levels in Floridians, and implications are discussed.

5:00PM ENV-8 Synthesis of Zeolites and Related Material from Native Florida Clay. JOHN S. NEIL, GIL A. ALMAGRO, AND DEAN F. MARTIN, Chemical and Environmental Management Services (CHEMS) Center, Department of Chemistry, University of South Florida, Tampa 33620. The manufacture of synthetic zeolite, accomplished in the early 1960's (Sand and Holding), produced synthetic mordenite from pumice. The production of zeolite from clay is common, but it has never been accomplished with the native Florida clays. For our initial synthesis we have chosen waste phosphatic clay obtained from IMC test pit number 3. These materials were of known composition and typical of the waste clays found in the Florida phosphate barring region. It is our intention to treat the clay with commercially available sodium hydroxide in a stoichiometric ratio to produce the desired zeolite. The material produced will be compared with the untreated clay, and with commercially obtained samples of zeolite by x-ray diffraction.

5:15PM BUSINESS MEETING

GEOLOGICAL AND HYDROLOGICAL SCIENCES

SATURDAY 9:30 AM N-235

SESSION A

R. C. LINDQUIST, University of Florida, presiding

9:30AM GHY-1 The Use of Florida's Industrial Minerals-Past and Present. J.W. YON, Florida Geological Survey, 903 W. Tennessee Street., Tallahassee, FL 32303. Paleo Indians, about 12000 years ago, were the first to use Florida's industrial minerals. They used clays for pottery and chert for fashioning points and tools. In 1672, the Spanish used coquina to construct Fort Castillo de San Marcos at St. Augustine. Brick making in Florida probably originated during the colonial years. In 1829, Fort Pickens on Santa Rosa Island was constructed with locally produced bricks. The construction of a statewide railroad system in the late 1800's enhanced industrial mineral development. Phosphate first mined in 1888 and kaolin in 1892 were probably the first industrial minerals shipped out of Florida for domestic use. In the early 1900's crushed stone and lime from limestone, sand and gravel, fuller's earth, peat, heavy minerals, and building stone began making a contribution to Florida's economy. Since World War II, Florida's mineral industry has reached the billion dollar level primarily through the production of these minerals. Florida ranks fifth nationally in mineral production.

9:55AM GHY-2 Mapping Florida's Mineral Resources, S. M. SPENCER, Florida Geological Survey, 903 W. Tennessee St., Tallahassee, Florida, 32304. Urban encroachment into areas of proven or potential mineral resources increases with Florida's population growth and development. In 1985, the Florida legislature required all counties in the state to produce and implement an effective land use plan. The Florida Geological Survey is contributing support to this requirement by defining potential and actual economic mineral resource areas in order that they might not unknowingly be eliminated from Florida's land use plan. The Survey's Office of Mineral Resources is currently generating a series of county mineral resource maps. These maps entail a detailed literature search, field work, core and well cutting inspection, and map and text preparation. The maps are intended to define the areal extent of commodities such as clay, heavy minerals, limestone, dolomite, peat, phosphate, and sand. The format is designed for use by city, county, and regional planners.

10:20AM GHY-3 Stratigraphic Correlation of Outcrop Gamma Ray Profiles in Florida. R.A. JOHNSON, Florida Geological Survey, 903 W. Tennessee Street, Tallahassee, 32304. Utilizing a hand-held scintillometer, total count gamma ray profiles were run on outcrops exposing many different lithologies in Florida. Emphasis was placed upon those outcrops which exhibited one or more stratigraphic contacts in order to determine if changes in the gamma ray signature could be correlated with formation as well as lithologic changes. Since the lithologies present in each outcrop were already known from a previous detailed study, correlation of these lithologies with gamma ray response on a bed-by-bed basis allowed detailed comparisons of typical formation lithologies with total county gamma ray response. The outcrop gamma ray profiles were then correlated with subsurface borehole gamma ray logs to determine if specific lithologic entities (beds) or stratigraphic units (formations, members) could be identified in the subsurface more accurately using this technique.

10:45AM BREAK

11:00AM GHY-4 An Extension of the Intermediate Aquifer System in Northcentral Florida. R. W. HOENSTINE, R. COOPER, AND E. LANE, Florida Geological Survey, 903 W. Tennessee St., Tallahassee, Florida, 32304. Work by the Florida Geological Survey in cooperation with the Suwannee River Water Management District has further delineated the extent of the intermediate aquifer system in north Florida. A current examination of drillers' logs, cores and well cuttings in northcentral Florida shows that the intermediate aquifer system extends beyond Bradford County

northward into Baker County, northwestward into Union and eastern Columbia Counties and southward into northeastern Alachua County. This aquifer is stratigraphically a part of the Hawthorn Group. Most fresh water wells draw from one of two dolomite units situated at the top and bottom respectively of the Hawthorn Group section. Water yields, which may be related to the respective dolomite unit thicknesses, range from approximately 10 gallons per minute to as much as 30 gallons per minute.

11:25AM GHY-5 Ocala Environmental Report. ED LANE AND RONALD W. HOENSTINE, Florida Geological Survey, 903 W. Tennessee St., Tallahassee, Florida, 32304-7795. The Ocala urban area is one of the fastest growing regions in the nation. Such rapid urban growth places unusual stresses on the environment due to the demands of energy, construction, transportation, water supplies, geological hazards, and waste disposal. Because of the implied need the Florida Geological Survey has begun work on an environmental report for the Ocala area. The report will integrate geological, hydrological, and climatological data to illustrate the importance that geology can play in land-use planning for the area. Graphics will be emphasized as a means of presenting data in a format that can be readily used by the public and planners.

11:50AM BUSINESS MEETING

FRIDAY 1:30 PM G-101  
PLENARY SESSION I: Florida Academy of Sciences  
MARVIN IVEY, Hammond and Holman, P.A., presiding

FRIDAY 6:30 PM SHERATON JACKSONVILLE BEACH  
SOCIAL

FRIDAY 7:30 PM SHERATON JACKSONVILLE BEACH  
BANQUET AND PLENARY SESSION II  
FLORIDA ACADEMY OF SCIENCES

SATURDAY 1:30 PM N-235  
SESSION B  
R. C. LINDQUIST, University of Florida, presiding

1:30PM GHY-6 Early Diagenesis of Carbonate Sediments from Cotton Key, Florida Bay. M.E. McClain, J. Cortes, J. Leder, J.B. Meyers, W.F. Precht, P.K. Swart, MGG/RSMAS, Stable Isotope Laboratory, Univ. of Miami, 4600 Rickenbacker C'way, Miami 33149. Sediments and interstitial waters recovered in two shallow cores from Cotton Key were analyzed in an effort to determine the nature of diagenetic processes operating within the island. Sediments were analyzed for mineralogy and stable isotopes, while waters were analyzed for salinity, pH, alkalinity, major and trace ions, and stable isotopes. Our results indicate that high-magnesian calcite is dissolving throughout both cores. Aragonite precipitation is suggested by reduced Ca/Cl and Sr/Cl ratios in a core proximal to the island margin and in the upper portion of a core from the island interior. Dolomite, although present, did not appear to be currently precipitating in either core. Our results differ somewhat from those of previous workers. Most notably, this study contains the first reported occurrence of aragonite precipitation within mud-islands from Florida Bay.

1:55PM GHY-7 The Jay Fault in Panhandle Florida: Geophysical Evidence. J. L. WHITELAW AND D.L. SMITH, Dept. of Geology, Univ. of Florida, Gainesville, FL 32611. A gravity and magnetic survey conducted in three counties in western panhandle Florida shows large contrasts in Bouguer gravity anomaly and total field intensity magnetic values. The magnitude and configuration of the anomalies suggest the presence of the Jay Fault, a northwest-southeast trending inactive basement feature 4 km deep which continues southeastward across the Florida peninsula. Bouguer anomaly values decrease laterally from the fault trend by 20-30 milligals and are indicative of an imbricate basement truncation with a 3-4 km throw. The magnetic anomaly pattern across the zone displays a 200-300 nT contrast characteristic of subsurface displacement. Resolving the location and nature of the Jay Fault should contribute to the understanding of relative motions occurring during the Triassic separation of the North American and Afro-South American continental plates.

2:20PM GHY-8 Influence of Urban Runoff-Induced Flooding on Sinkhole Development: Gainesville, Alachua County, Florida. R. EDELSTEIN, JR. (1), AND D. P. SPANGLER (2), (1) University of Florida, Department of Geology, Graduate Student, (2) University of Florida, Department of Geology, Associate Professor. Urbanization of formerly rural portions of the Gainesville area accentuated the flooding experienced during recent rainfall events. These flood waters were generally channeled into the artificial retention basins of each development. The creation of this runoff water, by development of an area, and collection of the runoff water, in retention basins, promoted the development of sinkholes. The occurrence of sinkhole failure, in these retention basins, permitted direct introduction of potentially contaminated surface water into the Floridan aquifer. Generally it is the combination of geologic and hydrogeologic conditions, of an area, in conjunction with the increased runoff, that determine whether sinkhole failure will occur. Retention basin design can also contribute to the possibility of sinkhole development.

3:00PM GHY-9 The Geomorphology of Trail Ridge Near Folkston, Georgia. Richard H. Burkley, Jr., Dept. of Geology, University of Florida, Gainesville, FL 32611. This research, which was sponsored by E. I. DuPont de Nemours & Co., was undertaken to document the geomorphic character of Trail Ridge in this region and to obtain a better understanding of the interrelationship among geomorphology, geology, and groundwater. Stream and vegetation patterns were found to be controlled by the topographic gradient, underlying geology (e.g. "hardpans"), and groundwater movement. Detailed drilling indicated that ridge morphology and groundwater fluctuations were instrumental in forming several of the geologic units encountered. It is apparent from aquifer tests performed on different portions of the ridge that specific yield varies inversely with the topographic and hydraulic gradients.

2:45PM BREAK

3:25PM GHY-10 The DRASTIC Rating System: Application in Karst Terrain. R. H. STRANSKY (1), AND D. P. SPANGLER (2), (1) University of Florida, Department of Geology, Graduate Student, (2) University of Florida, Department of Geology, Associate Professor. The DRASTIC rating system was used to rate the contamination potential of three hydrologic systems in karst terrain. The unconfined Floridan Aquifer rated highest, followed by the Surficial

Aquifer, the Confined Floridan, and lastly by the Intermediate Aquifer Systems. Flow pathways were elucidated for contamination events that may occur in each of the major physiographic regions of the karst area. It is notable that any contamination that affects an upper unit will affect a lower unit as well. Karst plays a very complex role. Problems facing areas in karst such as illegal dumping, underground storage tanks, and stormwater runoff are analyzed in the context of three hydrogeologic systems and major physiographic provinces within karst terrain.

#### MEDICAL SCIENCES

FRIDAY 3:00 PM N-229

SESSION A

ROSEANN WHITE, University of Central Florida, presiding

3:00PM MED-1 Cross-reactivity of the Pollens of Paspalum notatum (bahia), Callistemon citrinis (bottlebrush), and Melaleuca leucadendron (melaleuca). S. HOSSEINY, M. J. SWEENEY, R. N. Gennaro, S. D. KLOTZ, and R. S. WHITE. Department of Biological Sciences, University of Central Florida, Orlando, FL. Antigenic extracts of bottle brush and melaleuca have previously been demonstrated to be cross reactive using immunolectrophoretic techniques. Immunoblotting and RAST inhibition analysis further demonstrated that the antigens were also cross reactive allergenically. Current investigations are directed toward substantiating the previous results and characterizing the individual extract components using gradient SDS-PAGE and Western blot techniques. The pollen extracts were purified into several components using SDS-PAGE. Transblotted SDS-PAGE gels were incubated with specific rabbit antisera or human "allergic" patient sera to determine the degree of cross-reactivity. These SDS-PAGE studies confirmed that a high degree of antigenic as well as allergenic cross-reactivity exists between individual components of the pollen extracts.

3:15PM MED-2 Evaluation of an Immunoblot Test For Allergen Specific IgE. R. S. WHITE, R. N. GENNARO, B. E. STANALAND, S. D. KLOTZ, and M. J. SWEENEY. Department of Biological Sciences, University of Central Florida, Orlando, FL.

Sixty new patients with the clinical diagnosis of allergic respiratory disease were evaluated for sensitivity to inhalant allergens by the following methodologies: prick and intracutaneous skin testing, radioallergosorbant testing (RAST) and a new modified "Immunoblot" test. A panel of 16 environmentally significant allergens was studied including molds, pollens, and animal danders. The Immunoblot method was found to be the most sensitive overall for determining the presence of allergen-specific IgE. Seventy-four percent of skin test positive reactions were also immunoblot positive but only 28% were RAST positive. This new in-vitro technique may be an excellent screening method since "Immunoblot" is quicker, cheaper, and more easily performed than RAST.

3:30PM MED-3 Seroprevalence of HTLV-I in the Central Florida Blood Donor Population. M.DONOHOE, R. WHITE, R. GENNARO, S. KLOTZ AND M. SWEENEY. University of Central Florida, Dept. of Biological Sciences, Orlando, FL, 32816 and Central Florida Blood Bank, Orlando, FL 32806. Central Florida Blood Bank tested 7,564 blood donors from December 1, 1988 to January 1, 1989 using a newly licensed HTLV-I ELISA antibody test. Ten of these donors (0.13%) were initially reactive. Six of these blood donors (0.08%) tested repeatedly reactive. Confirmatory results using Western Blot and RIPA are pending. All six donors were HIV-1 ELISA negative. Donor demographics revealed three of the six donors were male and the mean age of all six donors was 50 years. The seroprevalence of HTLV-I in the blood donor population of Central Florida appears to be rare as compared with the seroprevalence of HIV-1(0.3%).

3:45PM MED-4 In Vitro effects of Rifampicin and Clofazimine on Mycobacterium leprae. A.M. DHOPLE, I. ORTEGA AND C. BERAUER, Dept. of Biological Sciences, Florida Institute of Technology, Melbourne 32901. The urgent need for new drugs in leprosy is now well recognized because of widespread occurrence of M. leprae resistant to all anti-leprosy drugs currently being used. We have developed an in vitro system for screening potential anti-leprosy compounds. Using this system the M.I.Cs for both rifampicin and clofazimine against M. leprae were 300 ng/ml. No synergism was observed between these drugs and dapsone. However, a strong antagonism was observed when these two drugs were combined. Since these two drugs are part of current multi-drug therapy in leprosy, these results have potential implications on treatment of leprosy. We have now initiated screening analogs of both rifampicin and clofazimine in order to determine the structure activity relationships of these analogs against M. leprae in vitro.

4:00PM BUSINESS MEETING

#### PHYSICAL AND SPACE SCIENCES

FRIDAY 3:00 PM N-233

SESSION A

ROBERT CARSON, Rollins College, presiding

3:00PM PSS-1 The True Character of Two-Dimensional Systems. T.M. HAKIM, Physics Department, Jacksonville University, Jacksonville, FL 32211. An overview of lattice dynamics of two-dimensional systems is discussed. Recent experimental and theoretical results are presented. The goal is to understand the behavior of these low-dimensional systems and the role which dimensionality plays in revealing their properties.

3:15PM PSS-2 Classical Collisions Revisited. V. CONSTANT AND T.M. HAKIM, Physics Department, Jacksonville University, Jacksonville, FL 32211. Classical two-dimensional collisions are analyzed in terms of scattering angles and kinetic energies. This new approach reveals interesting features about elastic and inelastic collisions which are usually ignored by conventional procedures. Such results will incite the study of inelastic collisions from a purely statistical perspective.

3:30PM PSS-3 Averaging Schemes and Lattice Dynamics. P.R. HILLIKER AND T.M. HAKIM, Physics Department, Jacksonville University, Jacksonville, FL 32211. In lattice dynamics, averages over regions in the Brillouin zone must be computed. Sums are indispensable for a complete thermodynamic analysis of the systems of interest. The numerical computation is most effective when the functions to be averaged are evaluated at special points rather than over a dense mesh in the zone. Two such special point sets are presented and their application is discussed in the study of rare gas monolayers on graphite.

3:45PM PSS-4 Calculation of Low Temperature Mobility in Semiconductors. WAFAA ABDELHAKIEM AND J.D. PATTERSON, Physics and Space Sciences Department, Florida Institute of Technology, Melbourne, FL 32901. One of the main transport properties of interest for devices involving electron-light interaction, e.g infrared detectors, is mobility. At low temperature, electron scattering is mainly due to impurity scattering. Electrons are scattered elastically and a relaxation time approximation can be used for calculating the mobility. Specification of the potential energy function experienced by the electrons in the region of the impurity is the main problem in the analysis of scattering. In this report we calculate the relaxation time and the mobility for several different potentials.

4:00PM PSS-5 Parameters Affecting the Electromigration Phenomenon. R. ZIDAN, J. D. PATTERSON, AND J. BURNS, Physics and Space Sciences Department, Florida Institute of Technology, Melbourne, 32901. Electromigration is a transport phenomenon which occurs in metals when high density electrical current causes atoms to move in metals. We are mainly focusing on the thin film metals. A failure in the interconnecting part will cause a failure in the device. In this report, we review current theoretical approaches and propose some simple models for analyzing this very complex phenomenon.

4:15PM PSS-6 Optical Limiting with Semiconductors. Y. Y. WU, D. J. HAGAN, M. J. SOILEAU, AND E. W. VAN STRYLAND. Center for Research in Electro-optics and Lasers, Univ. of Central Florida, Orlando, 32826. We have developed several new techniques and numerical codes for characterizing semiconductor optical limiting devices. We conclude that two-photon absorption generated free carriers strongly defocus the input laser beam inside the semiconductors for picosecond pulses, thus effectively protecting the devices from damage. A ZnSe monolithic limiter based on this internal self-action with proper focusing geometry achieves a limiting energy as low as 10nJ having a dynamic range of greater than  $10^4$ . Theoretical analysis shows that this type of limiting device is suitable for broad-band operation. One problem under study is that damage occurs when using nanosecond input pulses. This is possible caused by the combined effects of a relatively short carrier lifetime and thermal self-focusing due to band-tail absorption with nanosecond pulses. We expect lower limiting thresholds and better damage-tolerance optical limiters by choosing smaller band-gap materials and materials with longer carrier lifetimes.

4:30PM PSS-7 Z-Scan: A Sensitive Method for Determining Refractive Nonlinearities. A. A. SAID, M. SHEIK-BAHAE, M. J. SOILEAU, AND E. W. VAN STRYLAND. Center for Research in Electro-optics and Lasers, Univ. of Central Florida, Orlando, 32826. We present a simple technique to measure the magnitude and sign of nonlinear refraction with better than  $\gamma/30$  sensitivity. We have employed this technique to measure the nonlinear index of refraction in carbon disulfide at

10  $\mu\text{m}$  due to thermal effect, which gives rise to self-defocusing of the beam, and due to the optical Kerr effect, which causes self-focusing. The experimental results were analyzed using a simple model which employs the ABCD matrix formalism for Gaussian beam propagation inside the nonlinear medium. This model is particularly useful for thick samples, where the sample thickness is greater than the confocal beam parameter, because it saves the complicated task of solving the nonlinear wave equation inside the material.

4:45PM PSS-8 Theory of Ion-Ion Recombination of Polyatomic Molecules. I.M. LITTLEWOOD AND R. PYLE, Dept. of Physics, Univ. of Central Florida, Orlando, 32816. We have previously presented results of the rate for recombination of positive and negative ions in gas mixtures of the polyatomic molecules methane and sulphur hexafluoride. Data taken for a variety of pressures and mixture compositions, and over a range of electric field strengths, show a marked dependence on plasma conditions. However, by use of an effective temperature determined by the ion mobilities, it was possible to combine data for different gas mixtures and pressures into a single curve. The data indicates a simple power law. We present a theoretical treatment of the same problem using inelastic and elastic collisions of the ions with the neutral gas molecules. Results of numerical simulations with the experimental data are presented.

5:00PM PSS-9 The Study of Solid Surfaces Using Photoacoustic by Absorbance Spectrometry, DEREK A. ROBERTS (1), T.M. HAKIM (1), and R. DEL DELUMYEA (2), (1) Physics Department, Jacksonville University, Jacksonville, FL 32211, (2) Millar Wilson Laboratory, Jacksonville University, Jacksonville, FL 32211. The study of particulate matter collected on filters is conducted using photoacoustic and absorbance spectrophotometry and the results of the two methods are compared. The design and construction of the sample cell, as well as the assembly of the components for the system will be discussed. The device will also be used in the investigation of energy-transfer systems in the solid state.

5:15PM PSS-10 Thermodynamics of Rare Gas Monolayers. S.J. SEEBA (1), AND T.M. HAKIM (2), (1) Physics Department, University of Florida, Gainesville, FL 32610, (2) Physics Department, Jacksonville University, Jacksonville, FL 32211. The self-consistent phonon theory, in its harmonic and Einstein approximations, is applied to study the thermodynamics of solid monolayers of rare gas crystals. These monolayers are considered in the floating phase in which the interaction with the substrate is negligible. Several properties of the systems, from specific heat to lattice expansion, are discussed.

5:30PM PSS-11 Low Temperature AC Resistivity of  $\text{Sb}_2\text{Se}_3$ . ATAUR R. CHOWDHURY (1), KALPATHY B. SUNDARAM (2), AND LEE CHOW (1), (1) Dept. of Physics, (2) Dept. of Elect. Engineering, University of Central Florida, Orlando, FL 32816. AC resistivity of  $\text{Sb}_2\text{Se}_3$  has been measured over a wide temperature range of 8-300°K at a frequency of 1, 10,  $10^2$ ,  $10^3$ ,  $10^4$ ,  $10^5$  Hz. Results show that AC resistivity is distinctly different from its DC counterpart and changes with change in frequency following a simple power law. Nature of this power law has been established and compared with existing theoretical models. Temperature variation of resistivity, at a given frequency, shows a characteristic peak as a result of strong electron-phonon scattering. The position of this peak is very sensitive to the change in frequency. An explanation of these characteristic behaviors of AC resistivity based on theoretical model of electron hopping will be presented.

5:45PM PSS-12 Activation Analysis of Trace Elements in Coal Slurry Pond Wastes. R.A.LLEWELLYN AND E.R. VARGAS, Department of Physics, University of Central Florida, Orlando 32816. Coal production in the U.S. is currently over 700 million tons annually. It is by far this country's most abundant fossil energy resource. Preparing that 700 million tons for market each year generates over 50 million tons of solid wastes at cleaning and washing facilities. Debris from the latter has routinely been collected in settling ponds and basins. High in coal dust content, the settled debris itself now constitutes a potential energy resource owing to its heat content, which equals that of lignite, and its ease of extraction. Unfortunately, that same debris contains much of the inorganic material originally in the coal. Neutron activation analysis of selected midwestern coal slurry settling pond samples has been done to assess some of the possible environmental problems associated with burning the wastes. Partial support of this project was provided by the University of Florida Nuclear Reactor Facility under the Cooperative Reactor Use Program.

6:00PM PSS-13 History, Construction, and Implementation of Multiplier-type High Voltage Power Supplies. J. BAKER, Jacksonville Univ., 2800 Univ. Blvd N., Jacksonville, 32211. Voltage Multipliers, as they were first used by Cockcroft and Walton, are examined as simple sources of the high voltages required in small-size (up to around 0.8 Mev) particle accelerators. The methods and materials of Cockcroft and Walton are recalled, and are compared with currently available methods and materials. Multiplier design parameters, including required component sizes, dielectric strengths, and configuration geometries, are explained. Characteristics of the output voltage, such as voltage ripple and drift, and methods for improving these characteristics, are investigated. Parts availability and cost are discussed. Finally, possible methods of mating the high voltage source to a simple linear positive ion accelerator are explored.

FRIDAY 6:30 PM SHERATON JACKSONVILLE BEACH  
SOCIAL

FRIDAY 7:30 PM SHERATON JACKSONVILLE BEACH  
BANQUET AND PLENARY SESSION II  
FLORIDA ACADEMY OF SCIENCES

FLORIDA COMMITTEE ON RARE AND ENDANGERED PLANTS AND ANIMALS

FRIDAY 10:00 AM G-104  
SESSION A: Symposium  
"Management of Non-game Wildlife: Beyond Planning to  
Implementation"  
I. JACK STOUT, University of Central Florida, presiding

10:00AM REB-1 Endangered Plants of Fakahatchee Strand State Preserve. D. F. AUSTIN (1), J. L. JONES (2) AND B. C. BENNETT (3), (1) Department of Biological Sciences, Florida Atlantic University, Boca Raton, FL 33431; (2) Florida Game and Freshwater Fish Commission, Immokalee, FL 33943; (3) New York Botanical Garden, Bronx, NY 10458. Analysis of the plants in the Fakahatchee Strand State Preserve shows that a large number of them are on one or more of the lists of endangered and threatened plants. Some 26 families and 105 species known from in or near the Preserve are either endangered, threatened and/or commercially exploited. Species endangered in some way constitute over one-fifth of those known from the Preserve. This large number of endangered plants within the Preserve heavily reflects the abundant tropical epiphytic element within the temperate plant communities. Comparisons will be made with other areas to show the uniqueness of the Preserve flora.

10:15AM REB-2 Temporary Ponds - Their Importance, Diversity and Sensitivity. S. C. WARNER AND W. A. DUNSON, Ecology Program and Dept. of Biology, The Pennsylvania State University, University Park, PA 16802. Temporary ponds, which can vary widely in both physical and chemical characteristics, are important breeding habitats for many species of amphibians. Data on the physical, chemical (particularly pH) and biological parameters has been collected on ponds in the Tallahassee area of Florida along with the ability of various amphibian species to tolerate low pH. Some species of amphibians are less tolerant to low pH and may therefore be excluded from many ponds but could utilize others. Other species may be excluded bybiological interactions. These ponds are affected by both natural and anthropogenic causes. This work is supported by the Non-game Program of the Florida Game and Freshwater Fish Commission.

10:30AM REB-3 Winter Population Structure of the West Indian Manatee, Trichechus manatus, at the Homosassa Springs Refugium. K.A. HICKS, J.G. MORRIS, AND A.C. SPELLMAN, Biological Sciences Department, Florida Institute of Technology, Melbourne, FL 32901. The population structure of the West Indian manatee was examined during the winter months from 1984 through 1988 at the Homosassa Springs refugium in Citrus County, Florida. This refugium has a manatee population composed of resident and transient individuals. The transient component travels primarily between the Homosassa and Crystal River refugia. The transients comprise 90 percent of the Homosassa population. The Homosassa winter population averages 180 manatees annually. The minimum population count of 85 manatees occurred during the winter of 1986. On any winter day, the Homosassa Spring waterway will contain 10 to 60 individuals. Adults comprise 63 percent, juveniles 33 percent, and calves 4 percent of the winter population.

10:45AM REB-4 The Effect of Boat Traffic Densities on Manatee Abundance and Distribution in Brevard County, Florida. A.P. CURRAN AND J.G. MORRIS, Biological Sciences Department, Florida Institute of Technology, Melbourne, FL 32901. Four study areas, two each of designated high and low manatee densities, were surveyed through bimonthly aerial and weekly land surveys. Boater questionnaires were distributed to supplement survey data and determine boater opinions on manatee issues. Manatees avoided high boat traffic density time periods. A greater number of manatees were sighted on the weekdays while boat traffic was greater on the weekends. Generally, the rate of manatees/two-hour time periods decreased as boat traffic rates increased. Study areas one and three were characterized by high manatee usage for traveling, resting or feeding. Area one is a summer aggregation area. Area three, a previously designated high manatee density area, may be used as a corridor to link two nearby aggregation areas. Questionnaire responses supported the boating survey data.

11:00AM REB-5 Florida Scrub Jay: Development of State Guidelines for Habitat Protection. M.T. Kopeny, Florida Game and Fresh Water Fish Commission, 620 S. Meridian Street, Tallahassee, FL 32399-1600. The Florida Scrub Jay (*Aphelocoma coerulescens coerulescens*), listed federally and in Florida as threatened, typically is found in open, oak (*Quercus* spp.) scrub vegetation. Being an upland community, oak scrub often occurs in areas coveted for a host of land use purposes and is being decimated rapidly. The Game and Fresh Water Fish Commission currently is developing guidelines for the protection of Florida Scrub Jay habitat. The guidelines are intended for use by regulatory agencies reviewing the potential impact and mitigation of proposed large-scale commercial and residential projects in Florida. I discuss here our tentative recommendations and the constraining factors of biology, politics and management feasibility that have shaped their development.

11:15AM REB-6 Effects Of Urban Development On Florida Burrowing Owls In Cape Coral, Lee County. B. A. MILLSAP (1) AND C. BEAR (2), (1) Nongame Section, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Rd., Lakeland, 33811, (2) Audubon Society of Southwest Florida, 1644 Kensington Ct., Ft. Myers, 33907. We compared nest densities, reproductive success, productivity, territory reoccupancy rates, and clutch initiation dates of Florida Burrowing Owls in different levels of residential development in our 36.2 km<sup>2</sup> study area in 1987 and 1988. Results suggest that owls prefered to nest in areas where 50 - 75% of lots were developed, compared with more or less developed areas. Pairs in areas where > 25% of lots were developed were more successful, fledged more young, and started nesting earlier than pairs in less developed areas. In the absence of disturbance, territory reoccupancy rates were higher in areas where > 25% of lots were developed. However, 22% of nests in developed areas were destroyed between years by construction, and few (34%, vs. 76% overall) of these territories were reoccupied.

11:30AM REB-7 Gopher Tortoise (*Gopherus polyphemus*) Habitat Use in Scrub and Slash Pine Flatwoods on the John F. Kennedy Space Center. L.A. GIOVANETTO AND J.G. MORRIS, Biological Sciences Department, Florida Institute of Technology, Melbourne, FL 32901. A 300 x 300 m study plot was established in a slash pine flatwoods stand with a mixture of well and poorly drained soil types. Gopher tortoises (*Gopherus polyphemus*) used all four scrub types (oak, oak/palmetto, palmetto, and disturbed) during the study, including both dry and flooded burrows. The mean density for this site was 1.89 tortoises/ha, ranging from 1.16/ha in oak scrub to 4.17/ha in palmetto scrub. Significant edge relationships were seen in oak and oak/palmetto scrub. Correction factors of 0.20 and 0.34 were determined for computing the numbers of tortoises from the numbers of active and inactive burrows, respectively.

11:45AM REB-8 Relocation of Florida mice from development sites: two examples. I. JACK STOUT (1), RICHARD E. ROBERTS (2), AND DONALD R. RICHARDSON (3), (1) Dept. Biol. Sci., Univ. of Central FL, Orlando 32816, (2) Depart. Nat. Resources, Hobe Sound 33455, (3) Dept. Biol., Univ. South FL, Tampa 33620. Development of Regional Impact review and project development orders required relocation of gopher tortoises and burrow commensals within (1) the Yamato Scrub, Boca Raton and (2) Quantum Park, Boynton Beach, Palm Beach county. Florida mice (*Podomys floridanus*) were live trapped and relocated to sand pine scrub set-asides within the development sites. Relocation site preparations included release of gopher tortoises and prescribed burning. Release of Florida mice was into tortoise burrows or hand-made burrows. Success of the relocations was monitored 10-12 months after animals were released. Relocated animals were captured on both sites. Success of the release was apparently influenced by the amount of woody plant cover available on the set-asides. Recommendations were offered for future relocations.

12:00PM REB-9 Resurvey of Wading Bird Colonies in Florida. D.E. Runde Nongame Wildlife Program, Florida Game and Fresh Water Fish Commission, 620 South Meridian Street, Tallahassee, Florida 32399-1600. A statewide survey of colonial breeding sites for herons and their allies in Florida was last conducted in 1976-78. Following a pilot survey in 1987, we began a systematic aerial resurvey of the state in 1988. Using LORAN-C and 1:150,000 scale maps, we followed E-W transects spaced 5 km apart. The present status (active or vacant) of known colony sites was determined, and size of each colony was estimated and augmented using aerial photos. Aerial surveys were followed by ground visits or helicopter surveys whenever possible. Our current emphasis is on accurately locating active colony sites and determining species composition for habitat protection efforts. Following completion of the survey, future work will emphasize monitoring of changes in colony size at selected colonies and calculating colony turnover rates.

## 12:15PM BUSINESS MEETING

FRIDAY 1:30 PM G-101  
PLENARY SESSION I: Florida Academy of Sciences  
MARVIN IVEY, Hammond and Holmam, P.A., presiding

SCIENCE TEACHING

FRIDAY 8:30 AM N-230  
SESSION A  
BRUCE GRAGG, Florida Keys Community College, presiding

8:30AM TCH-1 Numerical Analysis in Introductory Physics. G. L. FREED, Florida Keys Community College, Key West 33040. Physics courses generally stress analytical solution of problems. On the other hand, most "real world" problems necessitate solutions which rely on numerical methods. In order to briefly introduce numerical analysis, physics students develop simple computer programs for numerical analysis of physical problems. With guidance, students can successfully investigate numerical solution techniques

8:45AM TCH-2 Program of Excellence in Science Education. ALICIA A. ZUNIGA AND LEON A. CUERVO, Florida International University, University Park Campus, Biology Department, Miami, Fl. 33199. The "Program of Excellence of Science Education" was offered at Florida International University in Summer, 1987. Selected High School Teachers spent six weeks working in a research project of experimental science. Research work was performed under the direct mentorship of the scientist who sponsored the project. Each project accepted only one person as student. Most of our students were among the best science school teachers.

Important feedback from the students ranged from; commentary about new classroom strategies based on their hands-on experience, up to the need of more participation of High School Teachers in the Program of Enhancement of Science Education. Evaluations from all participating indicated that this was a highly successful program.

9:00AM TCH-3 Video Taped Earth Science Instruction at St. Petersburg Junior College. CHARLES J. MOTT, JOSEPH C. GOULD AND S. CARL OPPER, Division of Natural Sciences, Clearwater Campus, St. Petersburg Junior College, 2465 Drew Street, Clearwater, 34625. An earth science course that has been taught as an audio tutorial course over the past 20 years is being converted to use video tapes as the main information delivery system. Instructional methods include independent study in the Department's Earth Science Learning Center, seminars (called teachback sessions) and large group meetings.

9:15AM TCH-4 Reading and Writing Chemistry. CAROLYN E. PHANSTIEL (1) AND OTTO PHANSTIEL (2), (1) Florida Community College at Jacksonville, 11901 Beach Blvd., Jacksonville, FL 32216, (2) Stanton College Preparatory, 1149 West 13 Street, Jacksonville, FL 32209. People who teach chemistry have long recognized inadequate mathematics skills as a key problem for chemistry students. Not so obvious is the students' inability to read the textbook and to write coherently about chemistry. This presentation will deal with learning strategies for enhancing the reading of a chemistry text. It will also show the organization of a class into chemical corporations so that writing is used to clarify chemical concepts. These two methods have been used to increase retention and success of students in Advance Placement Chemistry. After experiencing a hands-on demonstration, participants in this session will receive charts and matrices for immediate use in classrooms and laboratories.

9:30AM TCH-5 Funding Grant Proposals. TOM KING, St. Petersburg Junior College, P.O. Box 13489, St. Petersburg, FL 33733. A step-by-step strategy is presented in developing a winning grant proposal and in locating the appropriate funding agency. Includes recommendations concerning proposal writing. Only 10% of educational faculty know how to write proposals or where to look for funding. The grants business is becoming increasingly competitive. Follow guidelines explicitly and develop proposals with the effort, care, and consistency a scientist would devote to the preparation of a paper for publication.

9:45AM BREAK

10:00AM TCH-6 The Development of an Integrated, Interdisciplinary, Field-Oriented, Laboratory Curriculum for Secondary School Educators in the Marine Sciences. WILLIAM TRANTHAM, Florida Keys Community College, 5901 W. Junior College Road, Key West, FL 33040. This project utilized a team teaching approach to train secondary school educators in application of scientific and technical equipment in the areas of astronomy, ornithology, oceanography, ecology and marine archaeology. The cooperative project between Florida Keys Community College and Pensacola Junior College incorporated the facilities and personnel of Fort Jefferson in the Dry Tortugas and the Gulf Islands National Seashore in the Pensacola area. The curriculum provided the opportunity for comparison of the ecology and maritime history of the north and south Gulf of Mexico. Funding was provided under Title II-Education for Economic Security Federal Grant.

10:15AM TCH-7 The Utilization of a Hands-on Approach to Beach Ecology to Motivate Secondary School Educators in the Marine Sciences. WILLIAM BENNETT, Pensacola Junior College, 1000 College Boulevard, Pensacola, FL 32504. This paper features a lecture slide presentation of the dynamic natural and artificial forces that shape and control the topography and species composition of the shoreline and upper beach areas of the Gulf Islands National Seashore in the Pensacola area and the Dry Tortugas, sixty-nine miles west of Key West. Specific emphasis will be given to field-oriented instruction to develop motivation in the marine sciences. Funding provided under a Title II-Education for Economic Security Federal Grant.

10:30AM TCH-8 Animal Rights: Whose Rights? Who is Right? PAULA J. THOMPSON (1) WITH DONALD BARNES (2), (1) Florida Community College at Jacksonville, 11901 Beach Boulevard, Jacksonville, FL 32216, (2) National Antivivisection Society, 112 North Carolina Ave., S.E., Washington, D.C., 20003. A health watchdog group argues cogently for additional animal testing before a drug is approved for use. An undergraduate biology major lobbies for the right to perform an exercise as an alternative to the required dissection, stating that it merely duplicates wellknown information. Whose rights should prevail? The animals? The humans needing the drug? The student? Who is right? A demonstration informal community education slide program grapples with these issues. This program includes a discussion of the case for animal rights led by a technical consultant for the feature film, Project X. Audience participation by researchers, educators, and the public is invited.

## 11:00AM BUSINESS MEETING

FRIDAY 1:30 PM G-101

PLENARY SESSION I: Florida Academy of Sciences  
MARVIN IVEY, Hammond and Holmam, P.A., presidingFRIDAY 6:30 PM SHERATON JACKSONVILLE BEACH  
SOCIALFRIDAY 7:30 PM SHERATON JACKSONVILLE BEACH  
BANQUET AND PLENARY SESSION II  
FLORIDA ACADEMY OF SCIENCESSOCIAL SCIENCES

SATURDAY 9:30 AM N-228

SESSION A

RUDOLF STOECKEL, Florida Institute of Technology, presiding

9:30AM SOC-1 Called by the Horologue: the Clock and Medieval Notions of Time. G. M. PATTERSON, Humanities Department, Florida Institute of Technology, Melbourne 32901. Dante's famous simile in the Paradiso "Then as the horologue that calleth us. . . so did I see the glorious wheel revolve" seems to anticipate a profound shift in European sensibility. This paper explores the clock as the symbol of emergent fourteenth century attitudes toward both social and universal order.

9:45AM SOC-2 Walker Percy's Ithanatos Syndrome and the Technology of Danger. K. L. SHEARER, Humanities Department, Florida Institute of Technology, Melbourne 32901. If, as Heidegger suggests, the essence of technology is danger, how threatening is the technology of behaviour, the sinister reality of which is uncovered by the psychologist hero of Percy's most recent novel? Examined will be the issue of how the resiliant ironic hero responds to the threat of the annihilation of freedom in a scientifically determined society.

10:00AM SOC-3 Dr. Strangelove's Progeny: The Scientist as Perceived by Popular Film. R. B. RIPPINAN, Humanities Department, Florida Institute of Technology, Melbourne 32901. Ironically, one of our most technologically sophisticated media takes an ambivalent view of the modern scientist. Using a number of representative contemporary films as illustrations, this paper examines the phenomenon of a popular art form that views science as being as menacing an enterprise as it is potentially benevolent.

10:15AM BUSINESS MEETING

**AMERICAN ASSOCIATION OF PHYSICS TEACHERS**

SATURDAY 9:30 AM N-233

SESSION A

BETTY VAIL, West Orange High School, presiding

9:30AM INVITED SPEAKER Dr. Mehdy Jabir

"The Physicist's Role in Nuclear Medicine"

10:30AM BREAK

10:45AM APT-1 Physics Teacher Computer Network. JAMES E. HOWARD, Trinity Preparatory School, 4001 SR 426, Winter Park, Florida 32792 and JOHN J. BRENNAN, University of Central Florida, Physics Department, Orlando, Florida 32811. All of us know well of the isolation of high school physics teachers. Never can we run down the hall for an answer to a tough question or for help in illustrating a complex principle. One possible solution to this dilemma is a computerized bulletin board system. A Florida DOE/University of Central Florida grant has funded for the second year the Physics Teacher Computer Network (PTCN). The PTCN includes sections for messages for teacher-to-teacher exchange, for general bulletins, for data files including test questions/worksheets/lab writeups, and for computer programs. The PTCN is connected into FidoNet, an international network of computers, and carries national message areas in physics and astronomy. Modems were distributed last spring to 25 teachers. Training sessions were held at local physics teacher's meetings and at the Florida Association of Science Teachers conference in the fall of 1988. A report on the status of the network will be given.

11:00AM APT-2 One Credit Graduate-Level Physics Courses for High School Teachers. JACK BRENNAN, Department of Physics, University of Central Florida, Orlando, FL 32816-0993. A report will be made on ten courses. Some of these courses were taught during a two week period in the summer. The others were taught on Saturdays for a total of four 9 a.m. to 4:30 p.m. meetings. These courses have proved popular. The four day Saturday courses have attracted physics teachers from an average distance of 88 kilometers. Having a master teacher on the staff is vitally important. The need of such courses will continue. Physics enrollment in Florida High Schools increased 14% between 85-86 & 86-87. Fifty seven percent of Florida's teachers of high school physics have themselves studied less than 21 semester hours of physics. Forty three percent will be retiring within 10 years. Funding has been provided by the Florida DOE and the University.

11:15AM APT-3 Design of a Senior Level Electro-Optics Laboratory\*. J.S. BROWDER, P.R. SIMONY and T.M. HAKIM, Physics Department, Jacksonville University, Jacksonville, FL 32211. The integration of a new lab course combining techniques in optics and electronics is presented. A set of 13 experiments, which hinges upon undergraduate courses in modern physics, electronics and optics, is suggested. The objective is to achieve a detailed study of wave analysis, light source characteristics, properties of optical materials and fibers as well as holography.

11:30AM APT-4 Microcomputer-based Laboratories in Dynamics. E. Ronald Kirkland, Winter Park High School, 2100 Summerfield Road, Winter Park, FL, 32792. A force probe has been interfaced in combination with a displacement probe to the Apple II series of microcomputers by The Center for Science and Mathematics Teaching of Tufts University. "Simultaneous" readings of force, displacement, velocity, and acceleration for an object are now available in a lab setting for introductory physics. The students can quickly try "what if" situations to help them in conceptualizing some of the puzzling aspects of Newton's Second Law. Typical lab notes will be supplied.

11:45AM BUSINESS MEETING

SATURDAY 1:30 PM N-233

SESSION B

BETTY VAIL, West Orange High School, presiding

1:30PM APT-5 Fermi and SLAC Particle Accelerator Slide Programs. BETTY P. TREELE, Melbourne High School, Melbourne, FL 32901. This is a preview of the slide programs on Fermilab (proton) and Stanford (electron) particle accelerators now being field tested by American Association of Physics Teachers prior to distribution through its sales catalog. Each program features a tour of the facility tied to a brief description of the fundamental physics involved. The programs are designed particularly for the secondary and introductory college level physics student, but they will be useful at all levels for a basic understanding of particle accelerators and their functions. An outcome of the AAPT Conference on Teaching Modern Physics (Fermilab 1986), these programs have been developed with the assistance of AAPT and NSF grant #IEI-8550610 by Thad Zaleskiewicz, University of Pittsburgh at Greensburg, PA 15601; James E. Miller, Myersdale Area High School, Myersdale, PA 15552 and the presenter.

1:45PM APT-6 Moments in Modern Physics. R.A. LLEWELLYN, Department of Physics, University of Central Florida, Orlando 32816. As an integral part of the UCF Modern Physics course a number of significant occasions in the development of modern physics were presented as brief (7-9 minutes), in-class dramatic performances during the past year. The purpose of the low-budget performances was to enhance student interest, understanding, and retention. Each of the presentations focused on interactions between the human participants in the events selected. The short 'plays' contrasted sharply with the usual lecture format and, judging from student evaluations conducted at the end of the course, the experiment was enormously successful. The experiment also provided an unusual opportunity for cooperation between the Departments of Physics and Theatre. The performances, some serious and some humorous, were subsequently videotaped for use when live presentations are not possible. A video of one 'play' will be shown as part of the talk. Part of the modest funding for the project was provided by the UCF Learning Resources Council.

2:00PM APT-7 Comments on Teaching Physics Concepts As Applied to the Topics of Nuclear Arms and Strategic Defense Systems. ROBERT G. CARSON, Physics Department, Rollins College, Winter Park, FL 32789. In the nuclear age, students should be interested in the topics of nuclear arms and the possibility of nuclear war. But, for an audience of students not oriented to science, which physics concepts related to these subjects can be presented in a reasonably understandable way? I will comment on some of these such as the nuclear physics of bombs and the proposed lasers and particle beams of SDI. These are a few of the topics covered in a course on nuclear arms and nuclear war I teach to undergraduates of various majors. Some comments will also be included that pertain to a workshop titled "Enlightenment: The Best Security in a Nuclear-Armed World" that I participated in from January 6-10, 1989, hosted by the University of Miami Center for Theoretical Studies.

2:15PM APT-8 A Second Look at the Franck-Hertz Expt., K.D. BARTHOLOMEW, B.E. HAYES#, J.S. HUEBNER, K.J. KOVACIC, T.L. SMITH and R.K. WHITE+, Nat. Sci. Dept., UNF, Jax, FL 32216. Students in the fall '88 Modern Physics Lab. operated commercial Franck-Hertz apparatus (Klinger) outside the range where plate current oscillations should occur, according to the usual theory (1). The oscs. were larger! Other expts. indicate part of the plate current is from either i) hot electrons passing the grid as a result of an extended mean-free-path, or ii) from photoelectric effect electrons from the grid. UV photon generation sites vary with grid potential (2), and would produce oscs. in plate current. Further expts. will be described. 1. PHYSICS OF THE ATOM, Wehr, Richards & Adair, 1984, & other mod. phys. texts. 2. J. S. Huebner, Am. J. Physics 44, 302 (1976). # Sci. Dept., Bartram School, Jax, FL 32207, + Math Lab., FCCJ, Jax, FL 32202.

2:30PM BREAK

2:45PM DEMONSTRATION SESSION

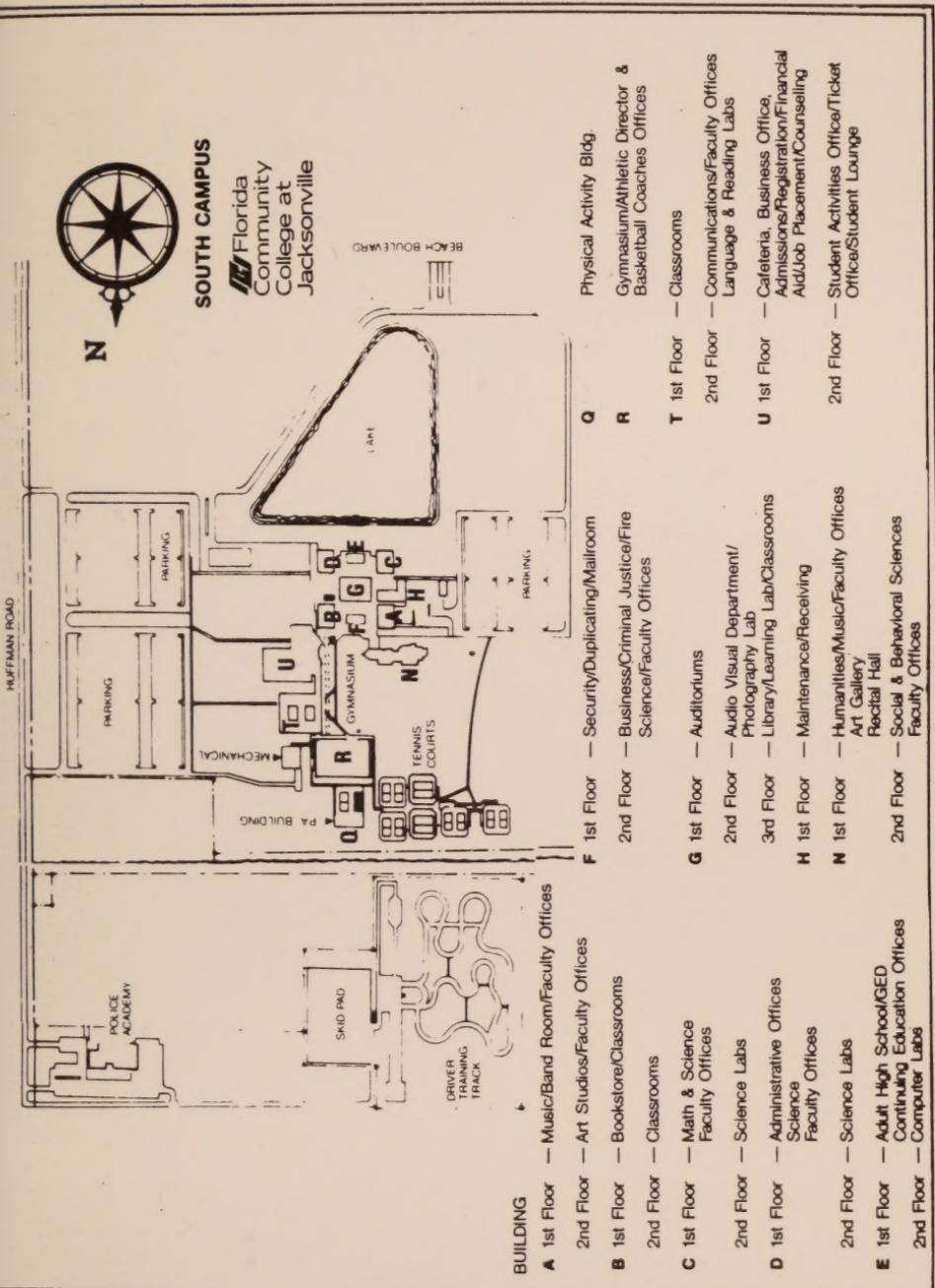
3:45PM ANNOUNCEMENTS

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Map of Jacksonville and Vicinity

